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INDIA

Production of Quality Mutton

G. S. Bali and T. R. Sharma

(*Defence Food Research Laboratory, Mysore, India*)

The desirability of 'animal protein' as a component of army ration can hardly be overemphasised. The need has been recognised. The soldier and those involved in physical labour have learnt by experience that meat has something more than the fill in value.

A prime objective of the meat inspector is protection of the consumer by guaranteeing that meat so inspected and passed is from healthy animals, slaughtered and processed under sanitary conditions, and it is wholesome and suitable for human consumption.

Production of quality mutton involves breeding of mutton animals on scientific lines, procurement, transportation and efficient marketing system, selection of suitable age for slaughter when animals may have maximum carcass yield, specifications for acceptance, modern slaughterhouse facilities and utilization of slaughterhouse by-products.

1. Raw material—*Improvement in quality and population of meat animals :*

In most affluent countries 'meat' has been organised into a well established industry. Today, meat is America's third largest industry next to steel and automobiles. We are one of the largest livestock holders in the world and still the availability of animals for meat purposes is limited and shortages are felt all over the country. NCST Panel on Consumer Industries has projected a requirement of 350,000 tons of meat from sheep and goat by 1979-80. To achieve this target, concerted and earnest efforts by Central, State and all the affiliated agencies will help in production of quality mutton and raw material for ancillary industries.

Improvement in the quality of meat and carcass yield per animal along with the total population of meat yielding animals require effective planning and implementation. These can be achieved by organising the prevalent system of rearing animal in villages and by setting large sheep and goat farms by the assistance of government in certain selected areas.

(i) *Improvement in the prevalent system :*

The age old system of rearing sheep and goat is still in vogue. Most of the families in a village keep about 5 to 15 animals. They are reared in a wayside barn. One of the children or older member of the family takes them out for grazing. Grazing is allowed only in already harvested fields and areas where no crop is grown. These animals are often fed with green leaves from the roadside trees and shrubs. Stall feeding is not done and usually no concentrates are given. Recognised plan of breeding is not practised. No proper veterinary cover is given to these animals. Animals, when they grow up, are sold to the local village contractor/middleman. Generally male animals are disposed off when they attain the age of 9 months to one year

and female 4 years to 5 years, when two or three offsprings have been taken. One male is normally kept for breeding of about 10 female animals.

It is suggested that some potential farmers interested in rearing these animals should be selected from each village. They should be registered with the nearest veterinary hospital. These farmers may be given one male animal (reared at the centralised breeding farm described in the later paragraphs) free of cost for every 10 female animals. A farmer must maintain a flock of 20 to 30 animals. This male animal can be either of a recognised Indian breed or even imported for the purpose. As a further incentive, animals belonging to this farmer may be given free veterinary consultancy and treatment service. Planned breeding and proper veterinary cover may improve the quality of animals produced in the country. Binding on the farmers will be to sell all the male animals except one or two which are kept for breeding when they attain the age of 9 months to 1 year and female 2 to 3 years when two or three offsprings have been taken. It has been reported [1,2] that if animals are slaughtered at this age they have the maximum carcass yield and an optimum texture profile. The agencies which should help the farmer in giving financial and technical assistance are Banks, local co-operative societies, Block Development Officers and Agriculture Research Institutes.

(ii) *Sheep and goat farms* :

State governments with the help of central assistance should open large scale sheep and goat farms. These should be self-contained for breeding, management and marketing of the animals to the local slaughter houses.

Defence which takes away the appreciable share of meat produced in the country must also rise to the occasion, to have their own sheep and goat breeding cum holding farms. It is to maintain steady supply of quality animals for meat purposes.

The estimated sheep and goat population and mutton production has increased since 1951 (Table 1).

This increase in population is due to natural increase and very small portion can be attributed to planned development.

The sheep and goat farming as a rural industry appears to be the only way to help and attain the desired objectives.

TABLE 1. *Sheep and goat population and mutton production*

	1951	1956	1961	1966	1971 (Projected)
A. *Sheep*					
(1) Population (Millions)	38.9	39.3	40.3	42.0	44.0
(2) Total production (thousand tonnes)	*88.9	91.9	93.6	98.1	102.6
* Assuming 26% availability and dressed weight of 9 kg per sheep.					
B. *Goats*					
(1) Population (Millions)	47.1	55.4	60.8	64.6	70.0
(2) Total production (thousand tonnes)	*137.2	149.6	164.2	174.4	189.0

* Assuming 30% available for slaughter and carcass weight of 9 kg.

2. Marketing and Transportation

About 292 thousand tonnes of mutton is processed in the country annually. By and large all the animals slaughtered for the purpose come from the farmers who rear them in remote villages. The channel through which the sheep and goat are moved from the farmer to slaughter-house are shown graphically (Fig. 1). Primarily each farmer is an agriculturist and rearing of sheep and goat provides him an additional income.

Individual farmer collects these animals and brings them to a local village mandi

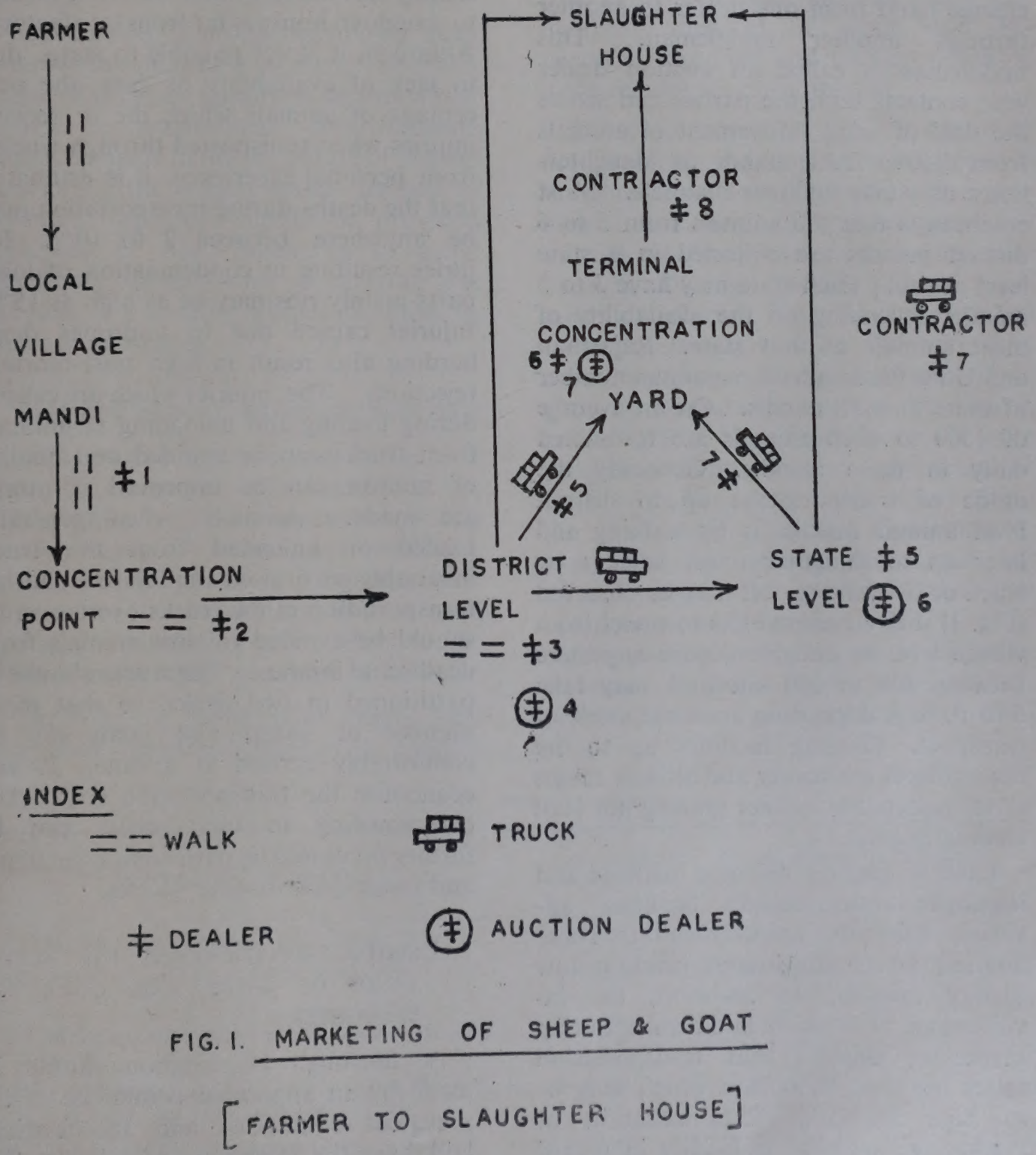

FIG. 1. MARKETING OF SHEEP & GOAT

[FARMER TO SLAUGHTER HOUSE]

for sale. A local dealer collects these animals from 4 to 5 villages and sells to another dealer at a concentration point. This point is generally located in a taluk or at a centralised place connected by a pucca or tar road. From here animals are taken to a district level animal mandi. Daily transaction of 300 to 500 animals takes place. These animals change hand from one dealer to another through another middleman. This middleman is called an auction dealer who contacts both the parties and settles the deal of sale. Movement of animals from district level mandi to slaughter-house may take different channels. Most common is that the animals from 5 to 6 district mandis are collected in a state level mandi. Each state may have 3 to 5 mandis depending on the availability of meat animals in that state. Rajasthan and Uttar Pradesh have maximum number of these animal mandis. On an average of 1500 to 2000 animals are transacted daily in these mandis. Generally the mode of transportation up to district level animal mandis is by walking and later up to slaughter-house usually by truck or by walking. It may be observed (Fig. 1) that an animal has to travel from village level to slaughter-house anywhere between 200 to 300 km and may take 5 to 10 days depending upon the mode of transport. Grazing facilities up to the district level are scanty and at later stages of transportation neither grazing nor stall feeding is done.

Lack of feeding, distance involved and improper transportation facilities adversely affect the animal health. These animals when slaughtered produce low quality mutton. In addition, the involvement of 4 to 8 middlemen during marketing channel and transportation raises the cost of mutton which may be as high as 95%. Rationalisation of marketing system, especially in regard to procurement of animals, transportation and reduction of middlemen, is necessary. A special marketing cell should be worked out on the pattern of co-operative organisation required to form ' Mutton Marketing Society '. It will help to break the monopoly of present animal contract system.

The transportation system employed during movement of animals from farmer to slaughter-house is far from satisfactory. Although, it is not possible to state, due to lack of availability of data, the percentage of animals which die or receive injuries when transported through trucks, from personal experience, it is estimated that the deaths during transportation may be anywhere between 2 to 10%. Injuries resulting in condemnation of local parts mainly ribs may be as high as 15%. Injuries caused due to improper shepherding also result in high post-mortem rejections. The injuries which are caused during loading and unloading of animals from trucks can be avoided and quality of mutton can be improved if ramps are made. Animals when generally loaded or unloaded from the truck invariably get bruised and injured. During transportation in the trucks overcrowding should be avoided to save animals from deaths and injuries. The trucks should be partitioned in two decks, so that more number of sheep and goats can be comfortably carried at a time. It will economise the transportation cost. The overcrowding in the corners can be further prevented by partitioning the upper and lower decks in four blocks.

3. Existing specifications for acceptance of sheep and goat for slaughter

A thorough examination should be made by an appointed committee of the prevalent conditions and specifications laid down for acceptance of animals. The clauses which are obsolete and redundant

should be removed and suggestions should be made to include those which are commercially possible to implement without affecting the quality of animals.

It is suggested that male animals should be slaughtered within the age of 9 months to one year and female 3 to 4 years.

4. Meat Inspection

In the chain of producing quality meat ante-mortem and post-mortem inspection is one of the most important factors which cannot be undermined. Improvements should be made in the procedure of inspection and extra helping hands trained as lay-meat inspectors should be provided especially in ASC butcheries to assist Veterinary Officer who is carrying out the task of providing wholesome meat to Defence personnel.

5. Modern Slaughter-house facilities

The term slaughter-house in India is generally connected with something like 'filthy place'. This conception should not hold good if these meat producing centres are subjected to minimum code of practice of Food Hygiene. A well operated slaughtering plant refers to the improvement in the standard of living.

The hygienic standard of nearly 3000 organised slaughter-houses in the country is far from satisfactory. The army butcheries though functioning at many places under adverse conditions have maintained comparatively better standard of sanitation. However, there is ample scope for improving the hygienic conditions of these abattoirs. The general plan and construction, animal pens, guillotining, skinning and evisceration areas, personal hygiene of men, materials and machinery involved, disposal of waste and by-products, handling and transportation of meat require special attention.

The Government of India is aware of the problem and has tried to improve slaughter-houses during various five-year plans. But most of the schemes[4] fell through at State levels due to financial reasons. During 1964-65, a liberal assistance of offering 50% loan by Central Govt. to state govt. also did not make much headway. Modernization of Slaughter-house Scheme during the Fourth and Fifth Five-Year Plans has made some progress. In this scheme, Government of India is participating in the equity share (2 : 1 : 1) ratio with State Governments, local Municipal Corporations and 2/3 of the project cost would be the loan component of the project. It is a 12 crores project and the cost is likely to increase further. Meat Corporations (Table 2) have been formed to initiate action.

Table 2. *Meat corporations*

Name of the corporation	App. project cost in lakhs	No. of animals to be handled daily
1. Modern Meat Complex Ltd., Panaji, Goa ..	108.00	150 cattle
2. Animal Food Corporation, Bangalore	400.00	2000 sheep/goat 150 large-animals
3. Modern Slaughter-house Dev. Corpn., Hyderabad	225.00	1500 sheep/goat 150 large-animals
4. The West Bengal Livestock Processing Development Corpn. Pvt. Ltd., Durgapur	80.00	500 sheep and goat
5. Tamilnadu Meat Industries Corpn., Madras ..	300.00	3500 sheep/goat 200 large-animals

In addition to that, some State Agro Industries Corporations, namely, Kerala, Maharashtra, Andhra Pradesh are coming forward to go ahead with export oriented meat trade.

Some of the private business houses, namely, Wimco, Tata, Lipton, Brooke Bond and such agencies are also exploring the possibilities to divert their activities towards meat export.

A modest beginning which has been made to modernise slaughter-houses in the country should be kept up. It should be seen these meat processing centres are of such standard that meat processed in these can be exported and accepted by developed countries.

A survey should be conducted of Army butcheries in the country and recommendations made to streamline them as per modern and scientific method of slaughter and processing.

6. Utilization of slaughter-house by-products

With the advent of modernization of meat industry, need for utilization of slaughter-house by-products will increase. Measures should also be adopted to utilize slaughter-house by-products under the prevailing system. A good old saying that ' excepting the last cry of the animal everything of an animal slaughtered should be utilized ', should hold good.

It has been estimated by the Planning Commission in their report on Survey and Utilization of the Agricultural and Industrial by-products and wastes carried out in 1963 that there is an annual loss of about Rs. 254 lakhs due to improper utilization of available slaughter-house by-products. Except the skin the utilization of other by-products is unexploited in our country. Unused slaughtered by-products and condemned meat if not properly disposed off will only create unhygienic conditions, public nuisance and act as a reservoir for spreading diseases.

Table 3 shows the estimated annual value of different slaughter-house by-products.[5]

Keeping in view the economic gains, prevention of diseases and hygiene, by-product plant may be justified at the slaughter-houses where at least 500 animals are slaughtered every day. Pooling of the by-products can be made at these centres from the nearby slaughter-houses. The creation of these slaughter-house by-product industry on a small scale seems to be the only viable answer. It will also lead to the establishment of secondary rural industries.

In addition to the non-utilization of slaughter-house by-products, country loses Rs. 29 crores annually due to fallen animals. It is suggested that as a modest beginning at least 50 carcass utilization centres, equipped with dry rendering plants, may be set-up in the various states.

Mrs Consumer and ' Langar Commander ' should have faith that they have paid reasonable price for the wholesome meat and this can only be achieved if improvements are made in the present day system of meat production.

Increased production of mutton and improvement in its quality will add to the national economy, generate more employment for the weaker section of the population and help in establishing nucleus for ancillary small scale rural industries.

TABLE 3. *Estimated annual value of different slaughter-house by-products in India*

Name of product	Unit	Estimated annual production of slaughter-house by-product	Estimated value (lakh Rupees)
Fats	Tonnes	26,856.1	738.54
Guts	,,	48,398.0	241.99
Blood	,,	30,162.2	75.24
Glands	,,	35,381.8	636.87
Oesophagus	,,	4,173.9	19.83
Bladder	,,	1,270.4	5.08
Useless meat	,,	22,690.0	181.52
Tail stumps	,,	150.6	1.20
Horns	,,	4,434.6	17.74
Hooves	,,	7,136.3	28.55
Bones	,,	22,083.6	77.29
Hides	Thousand pieces	1,541.0	231.30
Skins	,,	39,193.0	2,743.51
	Total ..		4,988.66

RECOMMENDATIONS

It is suggested that survey of the most of the army butcheries be conducted and recommendations made to improve :

(1) Slaughter-house facilities,

(2) Specifications for acceptance of animals,

(3) Standard of hygiene and sanitation,

(4) Procurement, marketing and transportation system,

(5) Streamline command and control of abattoir, and

(6) Training of lay-meat inspectors.

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Varietal Trials of Banana Grown in Kerala for Processing

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ABSTRACT

Twenty-four commercial varieties of banana grown in Kerala were screened with respect to their suitability for canning as chunks in syrup, pulp and puree, and for dehydration.

Giant Governor, Gros Michel, Highgate, Robusta, Harichhal, Red Banana, Thenkunnan *and* Nakiteebi *were found to be good for canning as chunks in syrup and as pulp. On varieties like* Dwarf Cavendish, Peddapacha, Mons-Marie *and* Poovan *gave products with better appearance and colour after the addition of ascorbic acid at 50 mg/100 g.* Pachakadali, Nendrapadathi, Pisanglillis, Pcc:kalli. Galanamalu *and* Charapadathi *varieties were of fair quality only.* Palayankodan, *due to its heavy pink discolouration and fibrous nature, was not suitable for canning. The varieties* Karpooravalli. Vennettu Mannan, Boothibale, Peykunnan *and* Chirapunchi *had seeds in the pulp which render them unfit for canning as chunks.*

Varieties found suitable for canning as chunks in syrup were also found good for canning as pulp. In all the low-acid varieties, addition of citric acid (to raise the acidity to 0.5%) improved the colour of the pulp and prevented gelation in some of the varieties. Ascorbic acid added at the rate of 50-100 mg/100 g further improved the colour and overall quality of the pulp.

From the varieties found suitable for pulp, 'puree' may be prepared by adding 40% water, raising the °Brix level of the pulp by addition of sugar and adjusting the pH to 4.0-4.2 with citric acid. Canned banana puree packed in plain (301 × 309) tin cans and processed for 10 min. in boiling water (at sea level) kept well for 1 year. Banana puree had better consumer acceptability than that of pulp. Being cheaper and economical, it should find ready market.

Banana figs prepared from Nakiteebi *and* Highgate *varieties had attractive golden yellow colour and good taste.* Robusta, Dwarf Cavendish, Peddpacha, Gros Michel, Mons-Marie, Harichhal, Red Banana, Thenkunnan *and* Pachakadali *yielded dried figs of satisfactory quality.*

Introduction

Banana constitutes the second most important fruit of India and of Kerala state, being next to mango. In Kerala, during the year 1974-75, about 47,140 hectares were under banana cultivation as compared to 62,530 hectares under mango. The total production of banana was 3.57 lakh tons[1]. Several requests were received from the industry for screening of different varieties of banana grown in Kerala for their suitability for processing. The Kerala Agricultural University, which grows as many as 124 varieties of banana at their Banana Research Station, Kannara, too desired the same. In the previous paper[2], screening of only 3 varieties namely *Nendran*, *Poovan* and *Palayankodan* was reported. The earlier reports relate to canning and/or processing of varieties of banana grown in Mysore[3-5], Australia[6] and U.S.A.[7,8] In the present paper, results of screening of 24 varieties of banana grown in Kerala for canning as chunks in syrup, pulp and puree and for dehydration are presented and discussed.

Experimental

Raw material : Twenty-four promising varieties of banana (Table 1) grown at the Banana Research Station, Kannara

* Present Address : Project Co-ordinator, CFTRI Experiment Station, Ludhiana- 6 (Punjab).

(Kerala Agricultural University, Mannuthy, Trichur District), were harvested when fully mature, ripened in the laboratory at room temperature to the desired level and used for processing.

Morphological and physical characteristics : The average fruit weight, length and circumference etc. were determined on the basis of measurements made on 20 fruits selected at random in each case.

Canning of banana chunks : Uniformly ripe fruits were hand-peeled, rags etc. removed, cut into 1.25 cm thick pieces, filled into plain 301×309 cans at the rate of 200-210 g each, covered with hot syrup of 25° Brix and 0.5 per cent citric acid. The cans were exhausted to a can centre temperature of 82-85°C, sealed, processed in boiling water for 10 minutes and cooled[9]. The cans were stored in a cool dry place. The effect of (i) addition of ascorbic acid (50 to 100 mg/100 g on total contents) for prevention of pink discolouration, and (ii) calcium chloride (0.05% on total contents) for improving the texture of chunks was studied.

Canning of pulp : The peeled fruits were steam blanched for 10 minutes, cut into pieces and pulped in a pulper. The following treatments were tried :

(i) Control (no treatment)

(ii) Addition of calculated quantity of citric acid to adjust the acidity to 0.5%. In varieties having acidity 0.5% or higher, no citric acid was added.

(iii) Same as (ii) but with added ascorbic acid at 50 mg or 100 mg/100 g.

After mixing with the additives, the pulp was heated to 85°C, filled hot into plain 301×309 cans, sealed, processed at 100°C for 10 minutes, cooled and stored in a cool dry place.

Canning of banana puree : The banana pulp obtained in the above manner was diluted with 40 parts of water. The °Brix of the resulting puree was adjusted to the original Brix of the pulp using sugar and the acidity raised to 0.5% with added citric acid (pH 4.0 to 4.2). The puree so prepared was heated to 85°C and canned in the same manner as that of pulp.

Dehydration : The peeled fruits were cut into halves longitudinally, spread on slotted wooden trays in a single layer and sulphured for 1 hour by burning sulphur at the rate of 200 g/10 c.ft. They were then dried in a cross-flow cabinet drier at 60-65°C to a moisture content of 8-10%. The time required varied from 8-10 hours.

Analysis : Moisture, sugar, titrable acidity, pH, ascorbic acid, protein, starch, crude fibre, total ash, ash insoluble in HCl, calcium, phosphorus and iron were estimated according to the AOAC methods[10]. The organoleptic evaluation was done by a panel of five trained judges. The average score of the five judges are only recorded.

Results and Discussion

Physical characteristics : The morphological and physical characteristics of the 24 varieties are given in Table 1. The skin of *Poovan* variety was very thin as compared to others. The varieties *Thenkunnan*, *Peykunnan*, *Palayankodan*, *Poomkalli*, *Pisanglilis*, *Karpooravalli* and *Boothibale*, etc. also had thin skin. Average weight of fruit ranged from 36.9 g in *Poomkalli* to 135.0 g in *Red Banana*. *Giant Governor*, *Robusta*, *Gros Michel* and *Boothibale* had average weights of 107, 109.6, 105 and 116 g respectively. The average weights of *Highgate* and *Karpooravalli* were 95.5 and 96.3 g respectively. The average circumference of the fruit ranged between 8.3 cm in *Pisanglilis* to

TABLE 1. *Physical characteristics of*

Particulars	*Giant Governor*	*Robusta*	*High-gate*	*Dwarf Cavendish*	*Hari-chhal*
Fruits					
1. Arrangement of heads and fingers ..	Compact	Loose	Loose	Loose	Loose
2. No. of hands per bunch	9	8	9	8	8
3. Average weight of hands (g)	1350	1350	1470	1070	1250
4. No. of fruits per hand	17	15	16	14	16
5. Total No. of fingers per bunch ..	110	115	108	110	110
6. Average length of fruit (cm) ..	15.1	19.3	17.7	15.0	17.3
7. Average circumference of fruit (cm) ..	11.2	11.1	11.0	9.6	10.3
8. Average weight of fruit (g)	107	109.6	95.5	56.7	79.4
9. Colour of ripe fruit	Greenish yellow	Greenish yellow	Greenish yellow	Greenish yellow	Yellowish green
10. Kind of skin thickness	Thick	Thick	Thick	Thick	Thick
11. Pulp : peel ratio	1.9	1.8	1.8	2.1	1.8
12. Colour of fruit pulp	Pale green	Light yellow	Pale green	Light yellow	Whitish yellow
13. Texture of fruit pulp	Soft	Soft	Soft	Soft	Soft
14. Taste and aroma	Good	Good	Good	Good	Good
15. Keeping quality (days)	4	4	4	4	4

TABLE 1.

Particulars	*Galana-malu*	*Pacha-kadali*	*Poom-kalli*	*Pisang-lilis*	*Karpoora-valli*
Fruits					
1. Arrangement of hands and fingers ..	Loose	Loose	Loose	Loose	Compact
2. No. of hands per bunch	5	4	10	4	9
3. Average weight of hands (g)	990	950	850	660	1500
4. No. of fruits per hand	15	14	17	16	16
5. Total No. of fingers per bunch ..	78	58	188	62	142
6. Average length of fruit (cm) ..	10.4	12.2	10.5	13.7	13.6
7. Average circumference of fruit (cm) ..	11.8	11.0	8.7	8.3	11.7
8. Average weight of fruit (g)	87.7	67.0	36.9	47.6	96.3
9. Colour of ripe fruit	Yellow	Deep yellow	Deep yellow	Yellow	Yellowish with greenish spots
10. Kind of skin thickness	Slightly thick	Slightly thick	Thin	Thin	Thin
11. Pulp : peel ratio	1.9	2.1	3.5	1.9	3.3
12. Colour of fruit pulp	Cream yellow	Light cream	Whitish	Light cream	Whitish
13. Texture of fruit pulp	Slightly hard	Soft	Soft	Soft	Soft
14. Taste and aroma	V. fair	Good	Good	Good	V. fair
15. Keeping quality (days)	5	5	4	5	8

different varieties of banana fruits

Pedda-pacha	*Mons-Marie*	*Gros Michel*	*Palayan-kodan*	*Poovan*	*Red Banana*	*Nakiteebi*
Loose	Loose	Loose	Loose	Loose	Loose	Loose
7	8	7	9	9	5	6
1250	1420	1280	820	1025	1650	1080
16	16	14	14	12	13	12
98	95	98	110	108	63	69
17.3	14.5	18.0	12.1	14.0	15.2	13.1
10.2	10.5	11.0	11.3	10.6	13.8	12.2
76.5	86	105	66.5	72.0	135.0	81.9
Yellowish green	Light yellow	Yellowish green	Deep yellow	Deep red	Orange red	Yellow, tip slightly green
Thick	Thick	Thick	Thin	Very thin	Thick	Slightly thick
2.3	1.8	2.0	2.4	4.2	2·6	4.1
Light yellow	Yellow	Whitish yellow	Light yellow	Whitish yellow	Greenish yellow	Greenish yellow
Soft	Soft	Soft	Slightly hard	Slightly hard	Slightly hard	Soft
Good	Pleasant	Pleasant	V. Fair	V. pleasant	Good	Good
4	4	4	8	5	6	5

Continued

Chara-padathi	*Boothi-bale*	*Vennettu Mannan*	*Nendra-padathi*	*Chira-punchi*	*Then-kunnan*	*Pey-kunnan*
Loose	Loose	Loose	Loose	Loose	Loose	Compact
7	8	8	5	8	7	9
925	1500	820	830	745	680	640
10	15	16	12	12	13	14
72	117	120	66	108	114	156
11.7	14.0	10.0	13.6	9.4	10.5	10.0
10.5	12.7	9.9	11.5	9.3	9.8	9.4
76.0	116.0	51.4	75.8	40.7	41.6	41.2
Dull greenish yellow	Dull greenish yellow	Dull yellow with green at the top	Uniform light greenish yellow	Greenish yellow	Yellow	Yellow
V. Thick	Thin	Thick	Thick	Thick	Thin	Thin
1.4	2.6	2.0	1.3	2.8	2.6	2.4
Whitish	Whitish	Whitish	Whitish	Whitish	Whitish	Whitish
Soft	Slightly hard	Soft	Soft	Soft	Soft	Soft
V. fair	V. fair	V. fair	Good	V. fair	Pleasant	Good
5	8	7	3	3	4	4

TABLE 2. *Chemical composition of*

Particulars	*Giant Governor*	*Robusta*	*Highgate*	*Dwarf Cavendish*	*Hari-chhal*
1. Moisture %	73.75	74.85	72.98	73.82	72.37
2. Total soluble solids °Bx	25.0	24.0	26.0	24.0	25.0
3. Sugars reducing %	11.90	8.20	10.10	9.10	10.10
4. Total sugars %	20.06	19.80	21.20	18.50	19.80
5. Acidity %	0.26	0.31	0.34	0.35	0.31
6. Ascorbic acid mg/100g	3.40	3.45	3.26	3.45	4.03
7. Protein (N×6.25) %	1.31	1.16	1.16	1.33	1.26
8. Starch %	Traces	Traces	Traces	Traces	Traces
9. Crude fibre %	0.38	0.39	0.39	0.37	0.38
10. Total ash %	0.78	0.97	0.92	0.78	0.84
11. Acid insoluble ash %	0.25	0.21	0.32	0.27	0.23
12. Calcium mg/100g	12.80	11.80	12.40	12.20	12.10
13. Phosphorus mg/100g	37.00	36.00	37.00	34.00	36.00
14. Iron mg/100g	0.38	0.46	0.38	0.38	0.37

TABLE 2.

Particulars	*Galana-malu*	*Pachha-kadali*	*Poom-kalli*	*Pisang-lilis*	*Karpoo-ravalli*
1. Moisture %	71.39	73.17	68.78	70.41	65.20
2. Total soluble solids °Bx	24.0	24.0	26.0	25.0	29.0
3. Sugars reducing %	3·30	4.16	17.90	8.30	5.00
4. Total sugars %	19.90	18.46	22.00	19.42	21.62
5. Acidity %	0.45	0.38	0.47	0.53	0.32
6. Ascorbic acid mg/100g	3.60	3.24	3.42	3.42	4.30
7. Protein (N×6.25) %	1.26	1.26	1.28	1.26	1.08
8. Starch %	0.70	1.06	1.90	2.75	4.25
9. Crdue fibre %	0.34	0.38	0.38	0.39	0.55
10. Total ash %	0.74	0.80	0.89	0.93	0.87
11. Acid insoluble ash %	0.23	0.28	0.31	0.37	0.22
12. Calcium mg/100g	13.40	12.90	13.20	12.90	12.60
13. Phosphorus mg/100g	32.00	36.00	31.00	34.00	32.00
14. Iron mg/100g	0.37	0.38	0.37	0.39	0.37

different varieties of bananas

Pedda-pacha	*Mons-Marie*	*Gros Michel*	*Palayan-kodan*	*Poovan*	*Red Banana*	*Nakitechi*
72.76	73.93	76.18	71.69	68.64	74.11	77.93
24.0	24.0	21.0	25.0	27.0	22.0	20.0
11.40	9.10	8.90	9.90	8.20	5.30	10.70
19.20	18.50	17.55	20.40	21.97	19.36	17.50
0.31	0.27	0.30	0.54	0.41	0.30	0.47
3.74	3.33	3.87	3.45	4.16	4.16	3.00
1.16	1.26	1.16	1.26	1.28	0.98	1.02
Traces	Traces	Traces	..	4.50	Traces	0.56
0.39	0.37	0.38	0.40	0.45	0.33	0.33
0.80	0.84	0.73	0.89	0.77	0.85	0.91
0.27	0.30	0.24	0.21	0.21	0.22	0.25
12.00	12.00	11.90	13.60	13.20	13.10	13.00
35.00	38.00	32.00	37.00	36.00	32.00	38.00
0.38	0.40	0.48	0.38	0.40	0.38	0.39

Continued

Chara-padathi	*Boothi-bale*	*Vennettu Mannan*	*Nendra-padathi*	*Chira-punchi*	*Then-kunnan*	*Pey-kunnan*
68.20	64.81	66.76	71.22	68.14	71.83	70.08
25.0	27.0	27.0	25.0	27.0	24.0	25.0
10.40	16.60	14.70	14.30	9.24	8.42	10.34
19.60	23.82	22.30	20.10	22.16	19.38	20.46
0.64	0.38	0.48	0.51	0.45	0.36	0.38
3.95	3.95	3.60	3.78	3.24	3.42	3.40
1.16	1.16	1.26	1.24	1.26	1.16	1.16
2.87	3.20	2.75	1.30	Traces	1.76	0.95
0.38	0.38	0.39	0.34	0.34	0.37	0.34
0.80	0.81	0.77	0.91	0.83	0.87	0.84
0.32	0.31	0.24	0.30	0.32	0.33	0.32
13.10	12.80	12.90	13.20	13.10	12.60	12.40
30.00	31.00	34.00	37.00	37.00	34.00	36.00
0.36	0.39	0.37	0.38	0.38	0.37	0.37

13.8 cm in *Red Banana*. The average length of the fruit ranged between 9.4 cm in *Chirapunchi* to 19.3 cm in *Robusta*. The pulp : peel ratio ranged from 1.3 in *Nendrapadathi* (the lowest) to 4.2 in *Poovan* (the highest).

Chemical composition : Among the varieties studied, *Karpooravalli* had the highest soluble solids content (29%) followed by *Poovan*, *Boothibale*, *Vennettu Mannan* and *Chirapunchi* (27° Brix), *Highgate* and *Poomkalli* (26° Brix), *Harichhal*, *Giant Governor*, *Palayankodan*, *Pisanglilis*, *Charapadathi*, *Nendrapadathi* and *Peykunnan* (25° Brix) (Table 2). The lowest percentage of total soluble solids was noticed in *Nakiteebi* (20° Brix). The moisture content ranged from 64.81% in *Boothibale* to 77.93% in *Nakiteebi*. The variety *Boothibale* had the highest percentage of total sugars (23.82%) and the variety *Poomkalli* had the highest percentage of reducing sugars (17.9%) among the varieties studied. The varieties *Giant Governor*, *Robusta*, *Highgate*, *Dwarf Cavendish*, *Harichhal*, *Peddapacha*, *Mons-Marie*, *Gros Michel*, *Red Banana* and *Chirapunchi* had only traces of starch. The varieties *Nakiteebi*, *Galanamalu*, *Peykunnan* and *Pachakadali* had 0.56, 0.70, 0.95 and 1.06% of starch respectively. The highest starch content was noticed in *Poovan* (4.50%) followed by *Karpooravalli* (4.25%) and *Boothibale* (3.2%). The varieties *Charapadathi*, *Pisanglilis*, *Vennettu Mannan*, *Thenkunnan* and *Nendrapadathi* also had starch content ranging between 2.87% and 1.30%.

Giant Governor, *Robusta*, *Highgate*, *Dwarf Cavendish*, *Harichhal*, *Peddapacha*, *Mons-Marie*, *Gros Michel*, *Karpooravalli* and *Red Banana* had low percentages of acidity ranging between 0.26% in *Giant Governor* to 0.35% in *Dwarf Cavendish*. The acidity was the highest in *Charapadathi* (0.64%) followed by *Palayankodan* and *Pisanglilis* (0.54 and 0.53% respectively). The ascorbic acid content ranged from 3.24 mg/100 g in *Pachakadali* to 4.30 mg/100 g in *Karpooravalli* among the varieties studied. The protein content was minimum in *Red Banana* (0.98%) and maximum in *Dwarf Cavendish* (1.33%).

The crude fibre content ranged from 0.33% in *Red Banana* and *Nakiteebi* to 0.55% in *Karpooravalli*. The ash content was maximum in the variety *Robusta* (0.97%) followed by *Pisanglilis* (0.93%) and *Highgate* (0.92%). There was not much variation in acid insoluble ash, calcium, iron and phosphorus.

Technological aspects : The present recovery of chunks was the highest in *Poovan* (73.23%) followed by *Chirapunchi* (69.50%), *Nakiteebi* and *Boothibale* (68.95 %), *Palayankodan* (67.55%), *Peykunnan* (67.10%), *Red Banana* (66.79%) *Poomkalli* (65.45%) and *Thenkunnan* (65.90%). The varieties of the second group namely *Pachakadali*, *Karpooravalli* and *Pisanglilis* yielded only 60.12, 63.24 and 64.90% chunks respectively. The percentages of chunks in the 3rd group of varieties namely *Galanamalu*, *Gros Michel*, *Harichhal*, *Giant Governor*, *Dwarf Cavendish*, *Vennettu Mannan*, *Peddapacha* and *Robusta* were 59.70 to 57.80%. In general, the yield of chunks was less than that of pulp as the ends were rejected and only good pieces were used for canning.

The yield of pulp was the highest in *Nakiteebi* (78.53%) followed by *Peykunnan*, *Chirapunchi* and *Poovan* (76.9, 75.9 and 72.06% respectively). *Thenkunnan* and *Karpooravalli* also had more than 70% pulp (71.19 and 71.21% respectively). In the second group, *Giant Governor*, *Highgate*, *Dwarf Cavendish*, *Harichhal*, *Gros Michel*, *Palayankodan*, *Red Banana*, *Poomkalli*, *Pisanglilis*, *Boothibale* and *Vennettu Mannan* gave pulp yield between 65 and 70%. The varieties of the 3rd group, which gave pulp yield

between 60 and 65%, were *Robusta*, *Peddapacha*, *Galanamalu* and *Pachakadali* respectively. *Mons-Marie*, *Charapadathi* and *Nendrapadathi* yielded 56.66, 55.68 and 57.58% pulp respectively and were rated 4th in grading.

Quality evaluation of canned banana chunks : Out of the 24 varieties screened, *Giant Governor*, *Gros Michel*, *Highgate*, *Robusta*, *Harichhal*, *Red Banana*, *Thenkunnan* and *Nakiteebi* were suitable for canning even without the addition of ascorbic acid as seen from the total organoleptic score (Table 3). *Dwarf Cavendish*, *Peddapacha*, *Mons-Marie* and *Poovan* gave better products with respect to appearance and colour of chunks after the addition of ascorbic acid at the rate of 50 mg/100 g. Heavy pink discolouration was noticed in *Palayankodan* variety which, in addition, was fibrous, and hence unsuitable for canning as chunks. From the total score of canned chunks with added ascorbic acid (50 mg/100 g), different varieties can be graded into 3 categories as shown in Table 3.

TABLE 3. *Grading of canned banana chunks from different varieties based on total score (Banana chunks canned with ascorbic acid)*

Grade I Total Score 75 and above		Grade II Between 61 and 74		Grade III 60 and below	
Variety	Total Marks	Variety	Total Marks	Variety	Total Marks
1. *Red Banana* ..	83	1. *Robusta* ..	71	1. *Palayankodan* ..	52
2. *Poovan* ..	82	2. *Dwarf Cavendish* ..	73	2. *Karpooravalli* ..	52
3. *Highgate* ..	83	3. *Harichhal* ..	71	3. *Boothibale* ..	51
4. *Nakiteebi* ..	75	4. *Peddapacha* ..	72	4. *Vennettu Mannan* ..	50
5. *Thenkunnan* ..	76	5. *Mons-Marie* ..	70	5. *Peykunnan* ..	47
6. *Giant Governor*	78	6. *Pachakadali* ..	73	6. *Chirapunchi* ..	52
7. *Gros Michel* ..	78	7. *Poomkalli* ..	71	7. *Charapadathi* ..	60
		8. *Pisanglilis* ..	74		
		9. *Nendrapadathi* ..	73		
		10. *Galanamalu* ..	64		

Scoring system : Out of total score of 100	(*a*) *Solids* :		(*b*) *Liquid* :	
	Appearance ..	5	Appearance ..	5
	Colour ..	10	Colour ..	10
	Texture ..	10	Taste and aroma ..	20
	Absence of black specks	10		
	Taste and aroma ..	20		
			(*c*) General quality ..	10
			Total ..	100

Quality evaluation of canned banana pulp : The organoleptic score of canned banana pulp and the results of cut-out analysis are reported in Table 4. In all the low acid varieties, addition of citric acid for raising the acidity to 0.5% improved the colour of the pulp and was found useful for prevention of pink discolouration. Same was the case in varieties having the natural acid content of 0.5 to 0.64%. Earlier, it was shown[4] that pink discolouration was mainly due to the effect of heat processing on leucoanthocyanidins or due to storage at elevated temperature and that organic acids and tin are not necessary for pink colour formation. According to these authors, under high temperature and long time of processing (at 110°C for 80 minutes), acids increased the intensity of colour[4], but in the present case, varieties of banana used and the conditions of processing employed are quite different and much milder (heating at 100°C for only 10 minutes). Other workers[3] also did not observe any adverse effect of addition of citric acid (0.15—0.2%) to covering syrup in canned banana chunks,

TABLE 4. *Grading of canned banana pulp (with added ascorbic acid at 100 mg/100 g) of different varieties of banana (Mean organoleptic score by 5 judges)*

Grade A Total score above 70		Grade B Total score between 61 & 70		Grade C Total score below 60	
Variety	Total score obtained*	Variety	Total score obtained	Variety	Total score obtained
1. *Robusta* ..	83.6	1. *Galanamalu* ..	67.3	1. *Palayankodan* ..	56.4
2. *Highgate* ..	81.8	2. *Pisanglilis* ..	63.8	2. *Pachakadali* ..	57.2
3. *Gros Michel* ..	81.8	3. *Boothibale* ..	69.8	3. *Karpooravalli* ..	59.2
4. *Giant Governor* ..	78.2			4. *Charapadathi* ..	58.2
5. *Dwarf Cavendish* ..	76.4			5. *Vennettu Mannan* ..	54.6
6. *Harichhal* ..	76.4			6. *Peykunnan* ..	53.6
7. *Peddapacha* ..	76.4			7. *Chirapunchi* ..	52.7
8. *Mons-Marie* ..	76.4				
9. *Poovan* ..	78.2				
10. *Red Banana* ..	76.4				
11. *Thenkunnan* ..	78.2				
12. *Nendrapadathi* ..	74.4				
13. *Nakiteebi* ..	70.9				
14. *Poomkalli* ..	70.9				

* Out of total score of 100

Scoring system break-up :

Colour and appearance ..	20
Consistency ..	20
Taste and aroma ..	40
Absence of black specks	20
Total ..	100

using mild processing conditions similar to ours. Addition of 50 to 100 mg of ascorbic acid per 100 g of contents further improved the colour of the pulp and added to their nutritive value as well. Heavy pink discolouration was noticed in *Palayankodan* variety (a varietal characteristic) which was overcome by raising the acidity to 0.5% by the addition of citric acid and ascorbic acid (50 mg/100 g). From the total organoleptic score of the pulp canned with the added ascorbic acid, the varieties of banana studied can be graded into 3 categories as shown in Table 4.

Canned banana puree : Banana puree prepared by diluting the pulp with water as described earlier yielded a good product (Puree) from the varieties of banana found suitable for canning as pulp. However, the consistency and taste (sugar : acid ratio) were better in puree and it had better consumer acceptability in general. The product is more economical and should find better market.

Dehydration : Out of the 20 varieties tried for dehydration, dried figs prepared from *Nakiteebi* and *Highgate* had golden yellow colour. *Robusta*, *Dwarf Cavendish*, *Harichhal*, *Peddapacha*, *Gros Michel*, *Mons-Marie*, *Red Banana* and *Pachakadali* figs were of satisfactory quality with regard to colour, eye appeal and taste. The varieties *Boothibale*, *Nendrapadathi*, *Poomkalli*, *Poovan*, *Karpooravalli*, *Pisanglilis*, *Charapadathi*, *Peykunnan*, *Chirapunchi* and *Vennettu Mannan* were not good for dehydration purposes.

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Combination Treatment of Gamma Radiation and Paraben in controlling spoilage of poultry meat

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Abstract

The results of combination treatment of poultry meat were quite encouraging and the flavour evaluation scores are presented which indicate the possibility of increasing the shelf-life of poultry meat by a couple of days as compared to untreated controls in refrigerated storage.

Introduction

To minimise the problems of radiation sterilisation at ambient conditions one can adopt low temperature irradiation. However, the effective dose at—75°C is of the order of 15% higher than that needed at O°C[1]. Flavour problems and drastic changes in food constituents on radiation sterilisation can be minimised by radiation pasteurisation[2] followed by low temperature storage. The net result of the combined process is to obtain a preservation effect equivalent to that with high radiation dose. Physical treatments that show promise are mild heating[3] to inactivate the enzymes resistant to radiation[4] and exclusion of air by vacuum packaging. Combination treatments, using chemical agents such as antibiotics, sensitisers and chemical preservatives, are also being developed. Many countries restrict the use of antibiotics because of their side effects if consumed regularly along with the foods. A sensitiser often has no activity by itself, but when present during irradiation may get activated or may react with food constituents to produce some synergistic effects. The chemical preservative acting by their mere presence in controlling the spoilage microflora should be selected carefully and should not give rise to toxic products during or after irradiation.[5]

A combination process involving food irradiation along with the food additive—sodium benzoate—has been suggested[6] for retarding microbial growth. The effect of radiation on food additives should, however, be studied with a view to explore (i) the toxic products formed due to irradiation of the additive and (ii) the toxicity caused due to the interaction of the additive with the irradiated food constituents or the container. However, irradiated packaging materials like polythene[5] had no effect on food constituents. In the present work propylparaben was used as a chemical preservative in the shelf-life prolonging process of raw poultry meat along with Co^{60} gamma radiation. However, the effect of radiation on this preservative itself is reported earlier[7]. Shelf-life of poultry varies with the temperature of storage[8].

Materials and Methods

Combination treatments : Dressed and eviscerated broilers purchased from a common market were brought to the

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laboratory in an ice container without much delay. Only bone free meat pieces were used for study. Meat pieces weighing about 25 g were taken in small screw capped dry glass jars, which were previously exposed to UV light with lids open to minimise external contamination. The samples were grouped into four categories—(*a*) control, (*b*) treated with 0.1% propyl-paraben solution, (*c*) irradiated with 0.1 Mrad dose, (*d*) combination treatment of (*b*) and (*c*). Control and irradiated samples were given a dip in sterilised water for two hours, whereas the other two samples were given a dip in 0.1% propyl-paraben prepared in sterile water for the same period (25 g sample in about 100 ml solution). To have optimum potency of parabens against a wide range of microorganisms 0.1% concentration of it was used. After the treatment the liquid was drained off aseptically and the lids closed. In one set the dipping treatment preceded irradiation and in another set it was given afterwards.

Method of flavour evaluation : Flavour evaluation was done by a taste panel of five members. Samples were graded 1 to 9 with 9 being excellent and 1 being extremely poor. On this scale a grade of 5 was just acceptable[9]. The judges were quite familiar with the fresh poultry meat flavour. No cooking, roasting or frying treatment was given to any of these samples, since the raw and freshness flavour was to be evaluated. The average values as determined by the judges on a blindfold basis are presented.

Uptake of propyl-paraben by poultry meat : The dipping time of the meat samples in the previous experiments was arbitrarily fixed as two hours. It was attempted to study the rate of uptake of parabens so that the operation could be performed in a minimum time. A piece of meat weighing about 25 g was immersed in 100 ml 0.1% propyl-paraben solution, irrespective of its size-shape and with regular time intervals, a known amount of the solution was drawn off and analysed quantitatively[7] for the residual paraben in it after extraction in ether.

Post-irradiation recovery of propyl-paraben from poultry meat : The samples given a combination treatment were analysed quantitatively for the preservative. This was thought necessary to know the effects of irradiation on the additive when present along with the poultry meat sample during exposure to radiation.

Results and Discussion

An antimicrobial agent is active in restricting the microbial multiplication, so far as the minimum inhibitory concentration of it is maintained. Similarly exposure to a sufficient dose of radiation could control the microflora by lowering the microbial load. A combined treatment may, therefore, be expected to cause an additive effect. Propyl-p-hydroxybenzoate is unaffected by the radiation energy[7] without loss of its antimicrobial potency can be used to maintain the post-irradiation antimicrobial effects of the preservative.

The observations on the uptake of propyl-paraben by the meat samples of weight 25 g are presented in Fig. 1. It is a well known fact that unless the bird is suffering from some disease there is little or no contamination of the poultry meat. The putrefaction starts mainly due to the external contamination mainly on the surface. Hence, a preservative dip treatment was attempted. However, diffusions of propyl ester to the interior of the meat was not studied. The minimum inhibitory concentrations of various esters of p-hydroxybenzoic acid

vary from species to species, however, yeasts are more resistant[10]. From the Fig. 1, it appears that the dipping time can be reduced to 10 to 20 minutes from two hours as if the meat sample could take up the ester within 6 minutes to the extent of 60%. Such a short time for propyl-paraben uptake by meat suggests that the inhibitor transfer is a physical phenomenon rather than a biochemical one. The amount of 2.4 mg/g of poultry meat sample is good enough to have the additive effect.

The sample, treated with paraben and combination treated, when analysed for the intact additive showed practically same amount retained even after radiation treatment. This amount ranged from 12-15 mg per 25 g meat sample in both the cases. This confirms the earlier observations[7] that propyl-paraben has no effect of Co^{60} gamma radiation.

If flavour changes and the total bacterial counts can be taken as major criteria of quality assessment of raw poultry meat, it is possible to extend the time of multiplication of bacteria by the above treatments. At room temperature, putre-

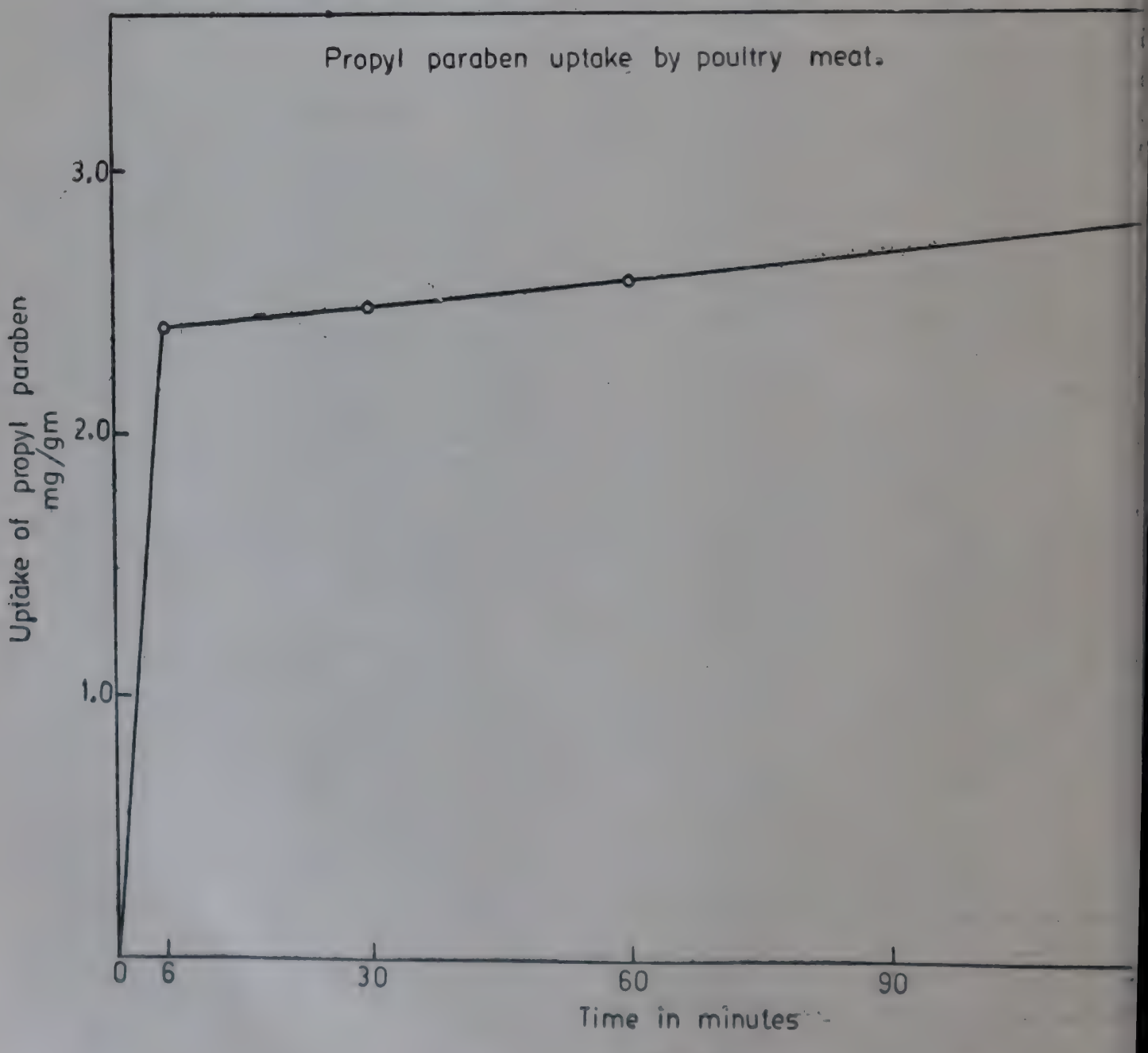

Fig.1.

faction sets even within 24 hours. The flavour evaluation values in Table 1 indicate that the panel apparently could not differentiate the treated sample indicating that irradiation flavours were not perceptible to the panel at 0.1 Mrad dose. It is apparent that flavour on the numerical basis follows a fairly consistent downward trend as the period of storage of the raw meat lengthens.

TABLE 1. *Flavour evaluation of the poultry meat samples*

Treatment	Storage time in days at 6° ± 2°C	*Combination treatment Flavour evaluation scores* Pre- or Post-irradiation
Control	0 - 1	9
	3 - 4	1
Propyl-paraben treated control	0 - 1	9
	3 - 4	7
	7 - 8	1
Irradiated control	0 - 1	9
	3 - 4	8
	7 - 8	7
	10 - 11	1
Combination treatment	0 - 1	9
	3 - 4	8.5
	7 - 8	8
	10 - 12	7
	14 - 16	5
	18 - 20	1

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Studies on Physico-chemical characteristics of some ber *(Zizyphus mauritiana* Lam.) Cultivars

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Abstract

The studies conducted on physico-chemical parameters of some ber cultivars showed considerable variations. Umran was found to be the best cultivar having largest size and maximum edible portion. The pulp was also less acidic. Besides this, the ascorbic acid content and ash percentage were also higher in Umran as compared to other cultivars. Total sugar content was high in Chhuhara and Dandan cultivars. Golar and Rohtaki Gola showed the maximum TSS content.

Introduction

Many ber (*Zizyphus mauritiana* Lam.) cultivars are available in different ber growing regions of India but in Punjab and Haryana, *Umran* occupies most of the area. There are quite a good number of cultivars which are liked by the different people, and the object of the present investigation is to find the most suitable one.

Materials and Methods

Six cultivars of ber, namely, *Dandan*, *Nalagarhi*, *Rohtaki Gola*, *Golar*, *Chhuhara* and *Umran* were analysed for their physico-chemical characteristics. For recording observations on fruit size, weight and pulp : stone ratio, twenty-five fully ripe fruits were randomly picked from five trees, in each cultivar. Ripening time was recorded when the fruits had developed a distinct colour and attained the optimum TSS percentage.

Total soluble solid (TSS) percentage was determined with a hand refractometer. Dry matter, acidity, mineral matter and total sugars were determined according to AOAC.[4] For ascorbic acid determination 2,6-dichlorophenol indophenol dye was used. Crude protein was determined after an estimation of nitrogen by micro Kjeldahl method (McKenzie and Wallace)[5] and multiplying by 6.25.

Results and Discussion

Data on the physico-chemical characteristics of fruit of six ber cultivars are presented in Tables 1 and 2.

The data in Table 1 reveal that the fruit size was largest in *Umran* and lowest in *Chhuhara*. The fruit length in *Umran* was the maximum (4.60 cm), followed by *Golar* (4.00 cm) and the minimum (3.20 cm) in *Chhuhara*. The fruit diameter was also the highest (3.40 cm) in *Umran* and the lowest (2.40 cm) in *Chhuhara*. *Umran* had the highest fruit weight (26.20 g) followed by *Golar* (17.80 g), *Nalagarhi* (16.80 g) and *Chhuhara* the lowest (9.36 g). Dhingra *et al.*[1], Randhawa and Biswas[2], and

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TABLE 1. *Physical characters of fruits of some ber cultivars*

Sl. No.	Cultivars	Shape of fruit	Colour of ripe fruit	Fruit size (cm) Length	Diameter	Average fruit weight (g)	Pulp : stone ratio	Ripening time
1.	*Umran* ..	Oval	Golden yellow	4.60	3.40	26.20	18.70	4th week of March
2.	*Chhuhara* ..	Ovate	Chocolate brown	3.20	2.40	9.36	9.36	3rd week of March
3.	*Rohtaki Gola* ..	Oval	Greenish yellow	3.56	2.65	11.28	14.10	1st week of March
4.	*Nalagarhi* ..	Obovate	Light yellow	3.76	3.05	16.80	14.00	4th week of March
5.	*Golar* ..	Ovate	Light yellow	4.00	3.00	17.80	19.30	3rd week of March
6.	*Dandan* ..	Oval	Golden yellow	3.80	2.50	10.10	14.00	3rd week of March

TABLE 2. *Chemical constituents of some cultivars of ber in per cent*

Cultivars	TSS %	Total sugars %	Reducing sugars %	Acidity (expressed as citric acid) %	Ascorbic acid mg %	Dry matter %	Total ash %	Protein %
Umran ..	17.2	9.7	3.81	0.151	118.90	13.25	0.64	0.79
Chhuhara ..	19.0	14.3	4.00	0.252	71.75	18.13	0.39	1.13
Rohtaki Gola ..	20.5	12.2	5.56	0.202	49.20	16.02	0.29	0.79
Nalagarhi ..	18.4	11.8	3.81	0.202	125.05	15.01	0.32	0.80
Golar ..	21.0	12.4	4.06	0.126	90.20	18.90	0.54	0.70
Dandan ..	18.5	13.7	4.23	0.126	98.40	15.58	0.41	1.40

Singh *et al.*[3] also obtained a similar fruit size in these cultivars.

Rohtaki Gola was the earliest to ripen followed by *Dandan*, *Golar* and *Chhuhara*, whereas *Nalagarhi* and *Umran* were late. *Umran* and *Dandan* had very attractive golden yellow colour, whereas a typical chocolate brown colour was noticed in *Chhuhara*. The highest pulp : stone ratio was recorded in *Golar* (19.30), followed by *Umran* (18.70) and the lowest (9.36) in *Chhuhara*. Higher pulp : stone ratio has also been observed earlier in *Umran* and *Dandan*[1, 2]. This variation might be due to the difference in agro-climatic conditions, cultural practices and crop load.

The TSS content of ber cultivars varied between 17.2 per cent recorded in *Umran* and 21.0 per cent in *Golar*. The total

sugars were higher (14.3%) in *Chhuhara* and the lowest (9.7%) in *Umran*. The higher sugar contents in *Chhuhara* have been reported by Randhawa and Biswas[2] and Dhingra *et al.*[1] The titratable acidity in fruit pulp was the lowest (0.126%) in *Dandan* and *Golar* and the highest (0.252%) in *Chhuhara*. Ascorbic acid content was the highest (125.05 mg) in *Nalagarhi*, followed by *Umran* (118.9 mg) and the lowest (71.75 mg) in *Chhuhara*. Randhawa and Biswas[2] reported relatively higher values in *Chhuhara* and *Dandan* and lower value in *Umran*.

Dry matter was the highest (18.9%) in *Golar* and the lowest (13.25%) in *Umran*. The ash percentage was the highest (0.64%) in *Umran* and the lowest (0.29%) in *Rohtaki Gola*. Similar ash contents in *Chhuhara* and *Dandan* and relatively lower in *Umran* have been reported earlier also[2]. The protein content was the maximum (1.40%) in *Dandan* followed by *Chhuhara* (1.13%) and the minimum (0.70%) in *Golar*. Similar results of protein contents in *Chhuhara* and *Dandan* have been reported by Randhawa and Biswas[2].

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Packaging Studies on Pulses and Cereal Flours in Flexible Films

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Abstract

To design suitable consumer packages for pulses and cereal flours, moisture sorption behaviour of the products under different relative humidities at 27°C and storage studies in flexible packaging materials under both accelerated (38°C and 92±2% RH) and normal environmental conditions (27°C and 65±2% RH) have been studied. The sorption studies have revealed that pulses and cereal flours exhibit typical sigmoid sorption behaviour and it has been found that moisture content of about 15% for pulses and 14% for cereal flours are critical with respect to various physico-chemical and microbiological spoilages. For long term storage of about 8-10 months and to withstand physical and environmental hazards, low-density polyethylene pouches of 400 gauge are quite suitable in offering the desired protection for pulses in unit packs of 500 g. However, for short-term storage of about 3-4 months, 200 gauge LDPE film is quite adequate. Under all conditions of storage, 200 gauge low and high density polyethylene film pouches are found suitable for the packaging of cereal (wheat) flours in unit packs of 500 g.

Introduction

In recent years, there is a steady increase in setting of self-service stores and supermarkets in the metropolitan cities and also there is growing trend on the part of the consumers to favour buying of foodstuffs in unit packages. The main reasons attributed for this are advantages such as protection against chemical deteriorative changes, minimal losses due to sifting, availability of clean, unadulterated product, and assurance of exact weight under hygienic conditions. Hence, in the years to come, there will be greater shift towards unit packaging in retail distribution of cereals, pulses and other foodgrain products.

Pulses and cereal flours are consumed by all sections of society in the country and form important sources of staple diet of the people. In the present system of retailing, the pulses and their dhals are offered for sale in quantities of 0.5 or 1 kg packed either in newsprint or low quality kraft paper and sometimes in plastic bags. Cereal products like wheat flour, maida etc. are packed in coarse textile bags or hessian sacks for bulk distribution and the bulk packages normally do not offer adequate protection to the contents. In the bulk packages, the product usually develop mould growth under high humid conditions of storage. Hence, studies on the moisture sorption by these products will be of much assistance in working out appropriate package profiles under varying conditions of environment for both retail and bulk distribution. Hubbard, Pixton and others[2, 3, 8] have reported sorption behaviour of many cereals but the data on pulses, dhals and their flours are sparse. It was felt, therefore, necessary to study the sorption behaviour of pulses and cereal flours in order to design functional and economical unit packs. As such, a study was undertaken to determine the humidity-moisture relationships of pulses and cereal flours to fix critical moisture limits and to provide the data regarding the allowable moisture pick-up for the safe storage

of these products to provide adequate shelf-life at high humidity and temperature conditions.

Materials and Methods

(*a*) *Sorption studies* : Pulses and their flours obtained from a Co-operative Marketing Federation and cereal flours from the local market were used in the studies. Moisture sorption behaviours of these products were studied by exposing about 15 g of each sample in petri dishes to different relative humidities ranging from 11-92% built up by using saturated salt solution[1] in desiccators at 27°C. The equilibrated samples were examined for their organoleptic qualities such as loss of hardness, free-flow characteristics, changes in colour, etc. From the loss or gain of moisture in the equilibrated samples at different humidities, the equilibrium moisture contents were calculated using initial moisture contents of the samples as determined by drying in an oven at 105°C for 24 hr. The results are presented in Table 1.

(*b*) *Storage studies* : Keeping in view the economics and other relevant physico-chemical attributes of the packaging material such as the permeability to water-vapour, dynamic tensile strength to withstand impact due to drop, low-density polyethylene film (LDPE) was considered quite suitable for packaging pulses in unit packs.

In order to fix the suitable gauge of the film for unit packs that can stand normal drop hazard, 0.9 metre drop tests were carried out using 200 and 400 gauge LDPE pouches of size 15×23 cm containing 500 g of pulses. The filled pouches were dropped on all sides. The studies indicated that 400 gauge LDPE pouches would not fail even after 100 drops and hence could provide the requisite protection against the drop hazard. Besides, 400 gauge LDPE film possesses the desired functional properties like low water-vapour transmission rate of 3-4 g as determined by the standard ISI method[4], needed for longer shelf-life of about 8-10 months and also it is reported that 400 gauge LDPE is resistant to many storage pests[5]. The data on the moisture pick-up by 0.5 kg unit packs of pulses in 400 gauge polyethylene are reported in Table 2.

Packaging and storage studies were carried out on wheat flour (*atta*) and maida in consumer size bags of 15×23 cm of the following packaging materials containing about 500 g under two conditions of storage, viz., (*a*) 38±1°C with 92±2% RH and (*b*) 27±1°C with 65±2% RH.

Packaging material	*WVTR* (g/m²d at 38±1°C and 92±2% RH)
1. 200 gauge low density polyethylene	6.4
2. 350 gauge low density polyethylene	4.2
3. 300 gauge high density polyethylene	3.9
4. 300 MST cellophane/150 gauge LDPE	11.6
5. Kraft paper	High

TABLE 1. *Humidity-moisture relationship of pulses, dhals, flours and cereal flours*

Material	Equilibrium moisture content under different relative humidities (dry wt. basis)									Initial moisture	ERH
	11	22	32	44	52	64	73	86	92	%	%
(A) *Pulses* :											
1. Tur dhal	6.1	7.3	8.6	9.7	10.8	12.5	14.3	23.7	30.4	11.6	60
2. Kesari Dhal	4.4	5.1	5.9	7.1	8.2	11.1	12.0	20.6	25.0	8.4	55
3. Masoor Dhal	5.8	7.5	8.7	9.7	10.9	13.3	15.4	21.8	22.7	11.5	55
4. Dried peas	5.6	7.0	8.4	9.8	10.7	12.9	16.8	22.1	28.2	12.0	60
5. Horse gram (whole) ..	4.8	6.5	7.8	9.1	10.5	12.9	15.9	20.6	23.2	14.4	70
6. Field beans (*a*) Dhal ..	4.6	5.9	8.0	8.7	11.1	12.4	13.4	23.2	27.9	12.4	65
(*b*) Whole ..	5.8	7.2	8.4	9.4	10.4	12.2	14.8	20.0	..	10.5	55
7. Bengal gram (*a*) Flour ..	5.9	7.1	7.3	9.8	10.9	13.2	13.9	23.4	24.9	11.4	55
(*b*) Dhal ..	5.9	7.1	8.5	9.6	10.8	12.9	16.6	21.0	23.6	11.4	55
(*c*) Whole ..	5.1	6.5	7.9	9.1	10.3	12.6	16.2	21.4	28.1	11.5	60
8. Green gram (*a*) Flour ..	5.5	7.2	9.0	9.1	10.4	12.4	16.1	21.9	27.0	11.1	55
(*b*) Dhal ..	6.1	7.3	8.6	10.1	11.3	13.5	14.5	22.7	24.3	12.2	55
9. Black gram (*a*) Flour ..	5.5	6.6	8.3	9.3	9.4	11.8	16.0	23.1	28.2	8.9	44
(*b*) Dhal ..	6.1	7.5	8.8	10.1	11.3	13.6	14.5	23.9	29.0	12.2	55
(*c*) Whole ..	4.8	6.8	7.9	9.0	9.6	10.9	..	12.1	15.8	10.6	60
(B) *Cereal flours* :											
10. Rice flour	5.5	6.8	7.9	9.5	10.8	13.3	13.9	20.2	24.2	6.6	23
11. Wheat flour (*Atta*) ..	5.4	6.7	7.8	9.2	10.5	12.9	13.6	20.6	24.7	11.0	53
12. Maida	5.9	7.8	10·4	11.4	12.8	13.7	14.4	19.6	21.8	12.2	50
13. Maize flour	5.0	7.3	9.1	10.5	10.9	12.2	14.9	18.8	22.4	11.0	53
14. Ragi flour	6.2	8.6	10.4	10.9	12.6	13.5	15.1	20.0	21.5	12.5	66
15. Jowar flour	6.9	8.2	9.9	11.4	12.2	13.9	14.4	20.1	21.4	12.2	52
16. BDH Starch	7.2	9.7	11.8	13.5	14.6	15.6	16.6	23.8	27.7	7.4	60

TABLE 2. *Storage studies of pulses packed in* 400 *gauge polyethylene and stored at* 92% *RH* and 38°*C*

Sl. No.	Food items	Quantity packaged in g	Initial Moisture content %	Moisture content, expressed as per cent increase over the initial value						
				Storage period in months						
				1	2	3	4	5	6	7
1.	Kesari Dhal ..	608	7.7	8.1	8.4	8.7	9.0	9.3	9.5	9.9
2.	Masoor Dhal ..	507	10.4	10.8	11.2	11.6	12.0	12.2	12.5	12.9
3.	Field Bean Dhal ..	608	11.1	11.3	11.6	11.8	12.1	12.2	12.4	12.7
4.	Field Beans whole ..	408	9.6	10.1	10.4	11.2	11.8	12.2	12.5	12.8
5.	Bengal gram flour ..	508	10.2	10.8	11.3	11.7	12.3	12.6	13.0	13.5
6.	Black gram flour ..	506	8.2	8.7	9.1	9.5	9.9	10.3	10.4	11.1
7.	Desigram (Bengal gram), whole	404	10.3	10.5	10.8	11.1	11.3	11.5	11.7	12.0
8.	Vatana (dried peas)	505	10.7	10.9	11.1	11.4	11.7	11.9	12.1	12.6
9.	Black Masoor Bold, whole	503	10.3	10.6	10.9	11.4	11.8	12.1	12.6	13.1
10.	Urd, whole (unpolished)	503	9.1	9.4	9.6	9.9	10.2	10.6	11.0	11.4
11.	Tur Dhal, whole ..	501	10.4	10.7	10.9	11.2	11.5	11.7	12.0	12.3
12.	Moong Dhal unpolished	503	10.9	11.1	11.3	11.6	11.9	12.1	12.4	12.7
13.	Urd Dhal washed ..	501	10.9	11.2	11.4	11.7	12.0	12.2	12.5	12.8

Six unit packs of fumigated samples were weighed individually and exposed to the conditions of storage. The packages were weighed periodically and examined visually for physico-chemical and microbiological changes in them during storage. The results are presented in Table 3.

Results and Discussion

(*a*) *Moisture sorption of pulses and cereal flours* : It can be seen in Table 1 that when the equilibrium moisture contents are plotted against the relative humidities, pulses exhibit typical sigmoid type sorption isotherms and with an initial moisture content of 10-11% equilibrate to an RH of about 60%. The whole pulses and dhals become soft and soggy at moisture level around 15-16% and the flours or pulses develop a musty odour and become lumpy above moisture content of 15%. It is generally recognised that foodstuffs are prone to microbial spoilage at different moisture contents which correspond to ERH of 70% and above[7] in which region the moisture sorption is quite rapid. As such, for pulses a moisture content above 15% corresponding to an RH of about 70% is critical with respect to microbial spoilage.

The equilibrium moisture content (EMC) of the different pulses are almost identical at lower RH conditions and slight variations in EMC are observed

at higher RH conditions. Such difference in EMC is perhaps due to the size of capillaries and can also arise due to the difference in the chemical composition of the different pulses. The EMC at 92% RH varies from 15.7% for the whole black gram to 30.4% for tur dhal.

The sorption behaviours for green gram dhal and Bengal gram dhal are similar to that of starch products, whereas in the case of *kesari* dhal which has a higher protein content[9], the sorption behaviour is somewhat akin to proteinaceous foods[6]. Whole pulses, in general, have much water holding capacity. Further, from the results presented in Table 1, it can be inferred that whole pulses will have lower EMC values compared to dhals and flours. This can be expected as the outer husk

TABLE 3. *Storage studies of atta at 27°C and 65% RH (Initial moisture content—8.8%)*

Packaging material	Storage period					
	30 days moisture	60 days moisture	90 days moisture	130 days moisture	160 days moisture	190 days moisture
D PE—350 gauge	8.9	9.0	9.1	9.2	9.3	9.3
HDPE—200 gauge ..	8.9	9.0	9.2	9.3	9.4	9.4
Polycell	8.9	9.0	9.1	9.6	9.7	9.8

Storage studies of atta at 38°C and 92% RH (Initial moisture content—8.8%)

Packaging material	Storage period						
	30 days moisture	50 days moisture	70 days moisture	90 days moisture	130 days moisture	160 days moisture	190 days moisture
LDPE—350 gauge	9.4	9.8	10.2	10.5	10.8	11.1	11.6
HDPE—200 gauge	9.5	9.9	10.4	10.6	11.1	11.5	12.0
Polycell ..	10.2	11.1	11.8	12.3	13.0	13.5	14.3
LDPE—200 gauge	9.7	10.3	10.7	11.3	11.8	12.3	12.9

Storage studies of maida at 38°C and 92% RH (Initial moisture content—13.0%)

Packaging material	Storage period				
	30 days moisture	45 days moisture	75 days moisture	90 days moisture	120 days moisture
LDPE—350 gauge ..	13.1	13.6	13.7	13.8	14.0
HDPE—200 gauge..	13.1	13.4	13.6	13.7	13.9
Polycell	13.4	13.6	13.7	13.9	14.0

in whole pulses acts to some extent as a barrier for the ingress of moisture.

It can be seen from Table 1 that cereal flours also exhibit typical sigmoid type sorption isotherm and with an initial moisture content of about 11-12% will equilibrate to an RH of 50-60%. Flours equilibrated to an RH above 73% develop musty odour and become lumpy. Thus, an EMC of 14% corresponding to an RH of about 70% is critical with respect to various physico-chemical changes and microbial spoilage.

The sorption behaviour of cereal flours resembles almost that of pure starch as presented in Table 1. In low humidity region, cereal flours, in general, have greater water holding capacity like starch even though the EMC at corresponding RH is comparatively lower than that of starch. According to Salwin[6], the calculated monolayer moisture value which defines the stable region for most of the processed starchy foods is about 6% (ERH—15 to 20%). As such, for good keeping quality of various cereal flours during storage, an initial moisture just above the monolayer capacity i.e. about 8% can afford good storage stability and cereal flours packed in suitable packaging media with this initial moisture content can be expected to have long storage life.

From sorption results obtained, it can be inferred that for pulses, a moisture content of about 15% and for cereal flours about 14% corresponding to ERH of about 70% are critical from the point of various physico-chemical characteristics and microbial spoilage, since above these levels of moisture products develop musty odour and are susceptible to mould growth.

(*b*) *Packaging and storage studies of pulses* : Data on the moisture pick-up by unit packs of pulses in 400 gauge LDPE bags stored at 92% RH and 38°C presented in Table 2 illustrate that the moisture pick-up of 1.6% in field bean dhal is minimum and 3.3% in Bengal gram flour is maximum at the end of 210 days storage. In general, the moisture pick-up by pulses and their flours falls in the range of 1.6-3.3% at the end of 7 months storage period and the samples were acceptable and did not reach the critical moisture level of 15%. Thus the results suggest at least seven months storage life at accelerated condition from the point of moisture ingress.

From the storage results obtained, it can be inferred that to withstand physical and environmental hazards during long-term storage and transport, especially on sea for export market, low density polyethylene of 400 gauge bag is quite suitable in offering desired protection for unit packs of pulses. However, unless for export trade and long-term storage under high humid conditions, use of 400 gauge polyethylene appears to be not economical as it unduly increases the cost of packaging for inland marketing, especially in supermarkets, wherein consumer unit packs are stored for a short-term period of about 4-6 months under normal conditions of humidity and temperature and also are not subjected to drastic mechanical hazards. 200 gauge low density polyethylene bag of 15×23 cm capable of taking about 5 drops of 0.9 metre is quite adequate in offering desired protection and is economically suited for packaging of pulses in unit pack of 500 g.

(*c*) *Packaging and storage studies on wheat flours* (*atta*) *and maida* : As revealed by sorption studies, it is clear that wheat flour (*atta*) and maida with their initial moisture contents of 8.8% and 13% have an ERH of about 40% and 65% respectively. Also, moisture level of about 14% is critical from the point of view of microbiological spoilage.

It can be seen from the Table 3 that wheat flour in bags of low density polyethylene 200 and 350 gauge and high density polyethylene 200 gauge does not attain the critical moisture level of 14% even after 190 days storage at 92% RH and 38°C. However, in the case of maida which had a high initial moisture content of 13%, this critical value is reached within 120 days in all packages studied. *Atta* and maida samples stored in kraft paper developed mould growth within 10 days at 92% RH and 38°C. However, at storage conditions of 27°C and 65% RH even kraft paper bag is quite suitable as it attains within 14 days maximum equilibrium moisture content of 12.2% at 65% RH and the moisture contents of *atta* are 10.1, 10.4, 11.5, 11.2, 12.2% in 2, 3, 7, 10, 12 days of storage respectively and remains safe at this moisture level.

From the results obtained it can be inferred that for long-term storage of wheat flour (cereal flours in general) at accelerated storage conditions, 350 gauge low density polyethylene and 200 gauge high density polyethylene bags or even 200 gauge low density polyethylene bags are quite suitable and offer the desired protection against ingress of moisture. However, it should be pointed out that for greater storage stability and longer shelf-life, especially where high humidity and temperature conditions prevail, packaging of the flours with an initial low moisture content of about 8% is advisable.

Acknowledgement

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'Chhang'—the fermented beverage of Himalayan folk

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Abstract

'Chhang' is a popular alcoholic beverage of the hill folk in western Himalayas. It is prepared by fermenting barley and contains 4.61% *alcohol,* 1.68% *dry extract and* 65.94 *meq total acids, of which volatile acids are* 3.18 *meq. A crude inoculum, called 'Phab' or 'Phopus' made of various plants and herbs is used for the fermentation. One strain of* Candida krusei *and two of* Saccharomyces uvarum *have been isolated from 'Phab' and their morphology reported.*

Introduction

'Chhang' is a light beer made from barley and other cereals. It is milky white suspension having sour taste and a villainous flavour. Since ages it is a popular drink of the hill folk in the alpine arid valleys of western Himalayas, including Ladakh region in Jammu & Kashmir State and Lahaul-Spiti District in Himachal Pradesh. The beverage is prepared round the year in one form or the other in almost every home and cheered by all young and old regularly [1–3]. Studies were conducted to survey its status and problems, traditional practices of preparation, chemical composition and yields, and the microflora of crude inoculum.

Methods of Chhang Preparation

The traditional practices for preparation of Chhang in Ladakh and Lahaul-Spiti are given below :

(*a*) Ladakh Technique

Raw material and preparation : Husk-less 'Sherokh' variety of barley (*Hordeum nudum*), locally called 'Grim', is mostly used which is one of the principal agricultural products of the region. The grains are cooked over a slow fire in water just sufficient for absorption and spread on a hessian mat or blanket to remove the free water. One kg 'Grim' yields 2.5 kg cooked material and is used as substrate for inoculation.

Inoculum : A crude inoculum, locally called 'Phab' or 'Phopus', is available in the form of small dry tablets weighing about 1 g each. It is made from certain plants and herbs grown in higher Himalayas. The extracts are mixed with wheat bran in a specific formulation, made into small balls and dried in shade. 'Phab' is reported to retain its potency, *in situ* for over a year. According to a study, the important plant constituents used in 'Phab' making are as follows[4] :

Sl. No.	*Local name*	*Botanical name*
1.	Nus ..	*Hordeum vulgare* Linn.
2.	Buwan ..	*Aconitum* (poisons) sps.
3.	Burnak ..	*Artemisia* sps.
4.	Brinjasif ..	*Achillea millefolium* Linn.
5.	Puncchi ..	*Taraxacum officinale* Weber.
6.	Tikta ..	*Swertia* sps.

7. Pather phodi — *Didymocarpus pedicellata* R. Br.
8. Blue poppy (Kaliharu) — *Meconopsis aculeata* Royle.

'Phab' is prepared by Tibetan Khampas only and the important centres of production are Nubra (Ladakh), Manali (H.P.) and Kalimpong (Sikkim). Its formulation and art of preparation is a closely guarded secret with the Khampas.

Inoculation and fermentation : The cooked 'Grim' at lukewarm stage is inoculated with 'Phab' using 1 g/kg of substrate. The tablet is finely ground, diluted with 'Sattu' powder (a form of wheatmeal) in the ratio of 1 : 3 and sprinkled over the 'Grim' followed by uniform mixing. The contents are filled in drill bags, often in 20 kg batches and tightly tied. These are further wrapped by gunny bags or woollen rags to maintain temperature around 30-35°C and left undisturbed to ferment. During this period, alcohol is produced alongwith some acids and completion of fermentation is judged by characteristic smell and oozing out of free liquid from the bag. This stage required about 8 days.

Storage of fermented stock : The mass is transferred to a narrow mouth stone or metal jar and filled up to the brim. The vessel is plugged tightly by cloth and covered with mud plaster to provide air tight sealing (Fig. 1). This stock, as such, can be kept preserved upto one month in summers and six months in winters without adverse effects on quality. A minimum storage period of 5 days is considered essential to enhance the aroma and alcohol content in the beverage.

Extraction of the beverage : When beverage is required to be made, the contents of sealed jar are transferred into an extraction vessel which is a cylindrical wooden vat having an opening at the base. A wooden stick wrapped by cloth piece at an end is used as a stopper tap whereby the flow of the liquid can be controlled (Fig. 2). Enough water is added into the vat to cover the grains and allowed to

Fig. 1 Storage of fermented 'Grim' in sealed pitcher

Fig. 2 Wooden vat containing fermented mass for beverage extraction

stand for 2 hours. During this process, alcohol, soluble constituents and other solids of the fermented ' Grim ' diffuse into water. The liquid is drained from the bottom tap and strained through a coarse sieve made of willow twigs (Fig. 3). This gives the first extract of liquid which is quite strong. Similarly two more extracts are taken with additional water. All the three extracts are blended and the product thus obtained is called ' Chhang '. The leftover ' Grim ' is used as animal feed.

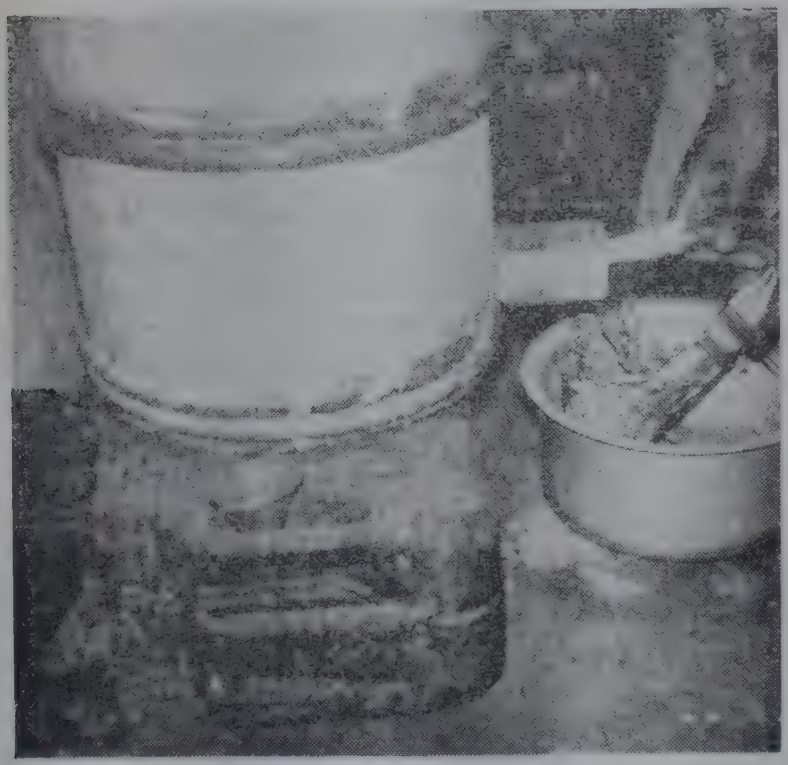

Fig. 3 Extraction of beverage and its straining

Yield : One kg raw ' Grim ' yields 6-7 litres of ' Chhang '. The beverage has a milky white appearance, sour taste and a spiritous aroma. It is prepared fresh when required and consumed as such, or often with addition of Sattu (a form of wheatmeal) to improve the taste. It is sold in the market at a retail price of Rupee one per bottle of 650 ml.

Other products : ' Chhang ' is sometimes distilled to produce a whisky like spirit, called ' Arrack ' , which contains about 40 per cent alcohol. This is also used for lightening the lamps.

(*b*) LAHAUL-SPITI TECHNIQUE

In Lahaul-Spiti area of Himachal Pradesh and certain eastward localities, other cereals like rice, barley and wheat are also used in addition to ' Grim '. The method of brewing also differs to certain extent.

' Phab ' is added to the cooked cereals at the rate of 3 g/kg substrate, i.e. 3 times the dose and fermentation completed in just 36 hours as compared to 8 days period practised in Ladakh. The fermented mass is stored in a sealed container for at least 2 weeks to develop characteristic aroma. However, with a still double dose of inoculum added initially i.e. 6 g/kg substrate, this period can be reduced to 1 week with same results.

In contrast to Ladakh where only one form of ' Chhang ' is in vogue, the latter areas have developed certain other recipes too. These are as follows :

' *Sing-sing* ' : This is similar to the ' Chhang ' beverage of Ladakh. Water is added to the fermented stock and extracts taken after allowing a contact time of 3 days in winters or 1 day in summers. Five extracts are taken and blended to produce a mild liquor. ' Sing-sing ' is normally made in winters.

' *Lugri* ' : The fermented stock is held in a cloth bag and mashed with hands. Water is added intermittently and the paste squeezed out till only bran and other fibrous materials remain. This has the appearance of rice pitch, is slightly sweet and consumed as such in summers.

' *Shull-shull* ' : Equal amount of water is added to Lugri, stirred well and allowed

to stand for half an hour. The supernatant clear liquid is decanted which contains most of the alcohol and other soluble matter. It is mostly consumed in summers as the beverage is believed to produce a cooling and thirst quenching effect. It is slightly sweet with a spiritous smell.

'*Buza*': The fermented stock is strained through a sieve to produce a thick paste of dough like consistency. It is also consumed mostly in summers. Moorcroft and Trebeck[3], while travelling in this area during 1819-25, reported a different but interesting practice of making buza beer prevalent at that time. The inoculated material is preserved in the form of dry cakes, which can be used when required to yield a fermented product. It is made from barley, the grain of which is parched and ground and later mixed with rice (softened by steeping in water). 'Phab' is added and the whole mass is put into a press to squeeze out extra water and dried. When required, a piece of dried cake is thrown into a vessel of water. Fermentation takes place in the course of 3-4 days and the liquor is ready for drinking. It has appearance of gruel or water thickened with oatmeal with sour and spiritous smell. It had been reported to be a favourite beverage with all classes which did intoxicate only if taken in excess.

Problems identified: The beverage has to be prepared fresh when required as it has the storage life of one day only. It develops high acidity and off flavours when stored for longer periods *in situ*.

Evaluation Studies

'Chhang' samples were prepared in the laboratory on the lines of Ladakh technique and studies conducted on the formation of alcohol and other constituents at different stages of the process. The raw materials, viz., 'Grim' and 'Phab' were procured from a 'Chhang' house in Leh, a town of Ladakh. The cooked grains were inoculated under aseptic conditions using 1 g 'Phab'/kg substrate. The fermentation was allowed in conical flasks, plugged with cotton and incubated at 30°±1°C for varying lengths of time. The flasks were later made air tight. 'Chhang' extracts were taken in an aspirator bottle adding enough water to cover the grains. Samples were drawn at different intervals and chemically evaluated. Standard AOAC methods[5] were employed for the analysis of various constituents, viz., ethyl alcohol, dry extracts, specific gravity, pH, sugars, starch and protein. For total acids, samples were titrated with 0.1 N NaOH solution to pH 8.1 using a glass electrode pH meter and volatile acids were determined similarly from the distillates. The difference was reported as fixed acids and all the acid values calculated as milliequivalents (meq).

Results

Samples prepared from the 'Grim' fermented for 1, 2, 4, 6, 8 and 10 days, with 2 hours contact period with water, were evaluated for alcohol, acids and dry extracts and the results are reported in Table 1. During first eight days of fermentation, alcohol and total acids increase gradually up to 6.45 per cent and 81.45 meq respectively in the beverage. There is no significant rise in alcohol levels further but acids constantly increase reaching 99.36 meq in 10 days fermented lots. This suggests that the fermentation period of 8 days as practised traditionally is optimum which also gives a product with suitable body (2.4 per cent dry extract).

TABLE 1. *Formation of alcohol, acids and solids during fermentation (First extract with 2 hours diffusion)*

Period for fermentation (days)	Composition of beverage				
	Ethyl alcohol %	Fixed acids meq	Volatile acids meq	Total acids meq	Dry extract %
1	0.40	11.92	..	11.92	0.40
2	2.30	31.22	2.00	33.22	1.60
4	3.68	39.67	2.67	42.34	2.00
6	5.06	56.34	3.63	59.97	2.10
8	6.45	76.67	4.78	81.45	2.40
10	6.60	94.44	4.92	99.36	2.40

In another set of experiments, water was added to the 8 days fermented 'Grim' and pattern of alcohol and solids diffusion studied by drawing the samples after 1, 30, 60, 90 and 120 minutes contact period (Table 2). Alcohol diffuses quickly into the water initially, reaching 2.05 per cent concentration within one minute and later steadily to reach 6.45% per cent in 2 hours period.

Similar to the first extract, two more extracts were taken by adding more water up to the grains level and allowing a diffusion time of 2 hours in each case. All the extracts were later blended to produce the final beverage. The yields and composition of different extracts are presented in Table 3. One kg raw 'Grim' yields 2.25, 2.10 and 2.08 kg first, second and 3rd extracts respectively and 6.43 kg blend. The chemical constituents get reduced in successive extracts. 'Chhang' has pH 3.0, alcohol 4.61%, dry extract 1.68%, specific gravity 1.007, volatile acids 3.18 meq, fixed acids 62.76 meq, total acids 65.94 meq, sugars 0.27%, starch 0.78% and protein 0.0022%.

Microflora of the crude inoculum

Microflora of 'Phab' was screened for yeast using dilution plate method by growing at yeast extract dextrose peptone agar media, pH 5.5. The plates were incubated at 37°C for 48 hours. Three strains of yeast were isolated and marked as C1, C2 and C3. These were studied and identified by National Collection of Yeast Cultures, Brewing Research Foundation, Surrey (England). Morphological studies were conducted using MYGP (Difco 0711-01) as liquid medium and MYGP agar (Difco 0712-01) as solid medium. The results are as under :

*C*1 : It is a strain of *Candida krusei* (Fig. 4). In liquid medium 24 hours old culture shows oval to long oval cells of (2-4) × (4-6.5) μ size occurring singly or in pairs ; in 72 hours the cell size increases to (1.5-3) × (3-8) μ ; 21 days old culture has a thin, white, climbing film and a deposit. In solid medium 72 hours old culture shows oval to elongated cells of (2-4) × (4-16) μ size occurring singly, in pairs or chains, whereas in 21 days it is

TABLE 2. *Diffusion of alcohol and solids into the beverage during its extraction (First extract with 8 days fermentation)*

Diffusion time (minutes)	Ethyl alcohol %	Dry extract %
1 ..	2.05	2.0
30 ..	4.31	2.1
60 ..	5.40	2.2
90 ..	6.07	2.4
120 ..	6.45	2.4

TABLE 3. *Yields and composition of 'Chhang'*

	First extract	Second extract	Third extract	Blended beverage
Yield per kg raw Grim (kg) ..	2.25	2.10	2.08	6.43
Alcohol % ..	6.45	4.54	2.70	4.61
Dry extract % ..	2.4	1.5	1.1	1.68
Specific gravity ..	1.010	1.007	1.003	1.007
Volatile acids meq ..	4.78	2.43	2.24	3.18
Fixed acids meq ..	76.67	63.33	45.56	62.76
Total acids meq ..	81.45	65.76	47.80	65.94
pH ..	..	..	..	3.0
Reducing sugars % ..	..	..	..	0.27
Starch % ..	..	..	..	0.78
Protein % ..	..	..	..	0.0022

slope of cream/white colour, dull appearance, slightly rough and mycelial edge.

C2 : It is a strain of *Saccharomyces uvarum* (Fig. 5). It produces pseudomycelium abundantly, a characteristic not usually so typical of the species, although it has been described before. The cells are oval or short-oval, occurring mostly singly, having (1-3) × (1.5-5) μ cell size when grown in liquid medium for 24 hours ; 72 hours old culture shows oval cells of (2-3) × (3.5-6) μ size ; occurring singly or in pairs ; 21 days old culture is very thin, milky, showing climbing film and a deposit. When grown on solid medium for 72 hours, the cell structure is round to long-oval of (2-4) × (2.5-7.5) μ size, occurring singly or in pairs and the 21 days old culture has cream colour, shows shining and smooth appearance with pseudomycelial sprouts.

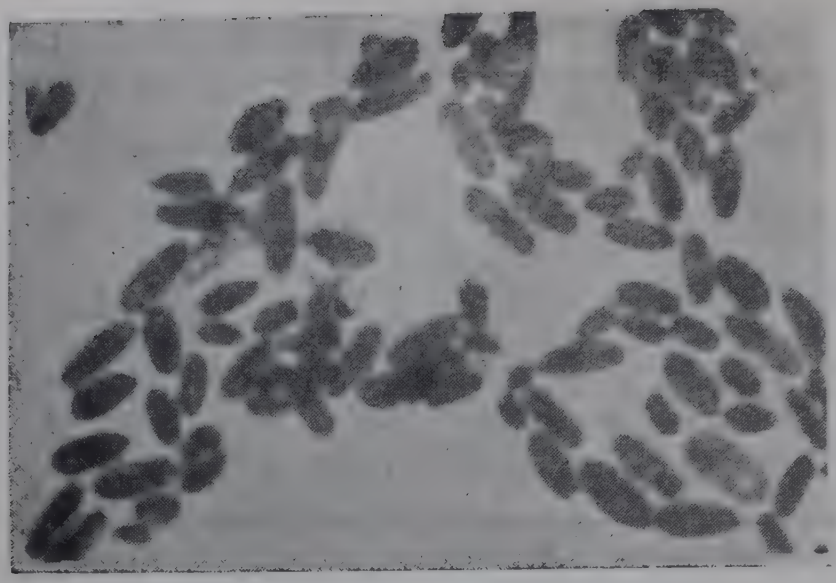

Fig. 4—Photomicrograph of Strain C1—*Candida krusei* after 24 hours growth (Magnification 1250 times)

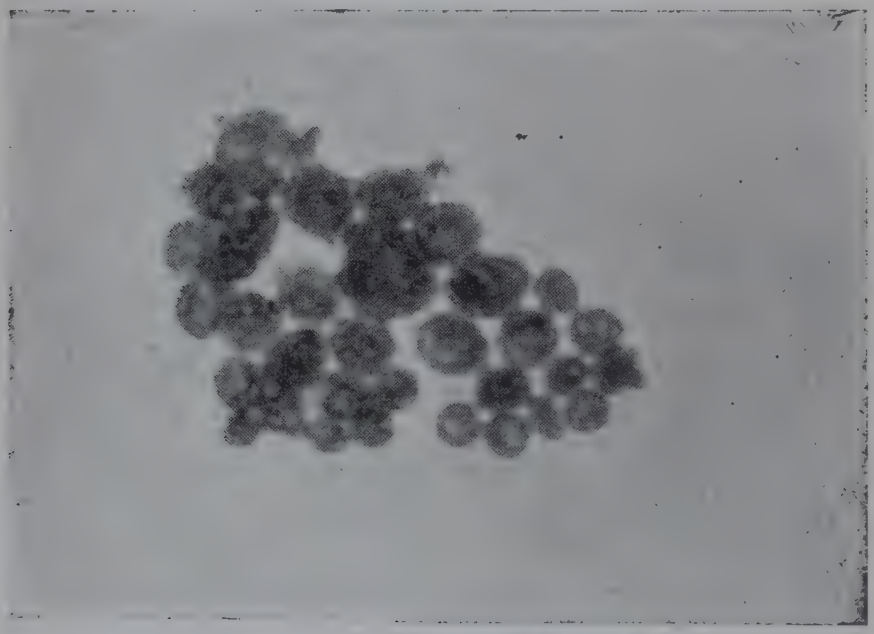

Fig. 5 Photomicrograph of Strain C2—*Saccharomyces uvarum* after 24 hours growth (Magnification 1250 times)

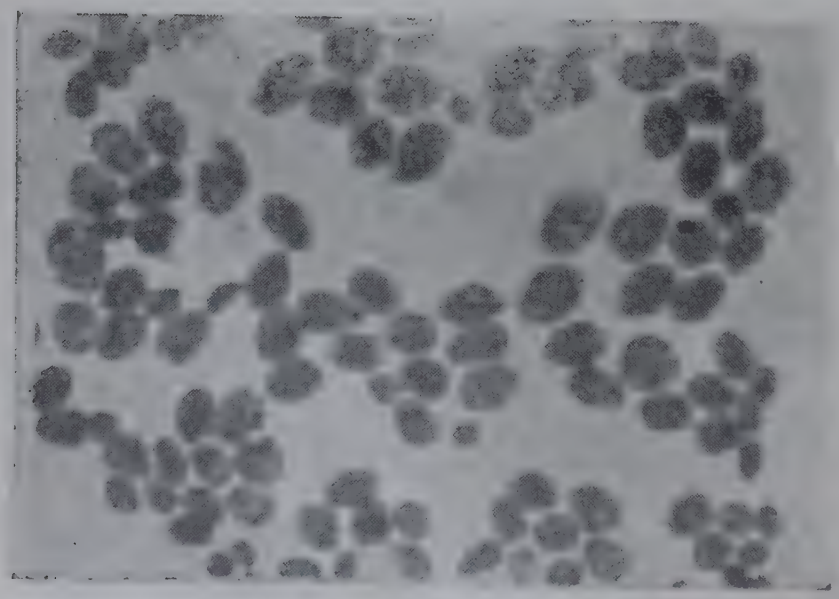

Fig. 6 Photomicrograph of Strain C3—*Saccharomyces uvarum* after 24 hours growth (Magnification 1250 times)

C3 : It is another strain of *Saccharomyces uvarum* (Fig. 6) resembling C2 in most respects but producing only a rudimentary pseudomycelium. It has comparatively larger cell size, i.e. (2.5-4) × (4-7) μ at 24 hours and (2-4) × (4-7) μ at 72 hours growth in liquid medium. 21 days old culture in liquid medium shows non-flocculent deposit and has no film or ring. When grown on solid medium for 72 hours, cells are round to oval of (2-4) × (2-6) μ size, occuring mostly singly and in 21 days the culture appears cream shiny and smooth.

The above account documents the available information about the mysterious fermented beverage prepared by Himalayan folk and named as ' Chhang '. Though an attempt has been made to decode this beverage, further detailed studies are required to be conducted on various aspects. These have been taken up on the following lines :—

1. Microbiological—Isolation and identification of microflora, particularly fungi, associated with the liberation of amylases for starch saccharification, yeast for fermentation of sugars into alcohol and bacteria for organic acid production; use of selective strains to improve upon the product quality.

2. Chemical—Analysis of substrate and ' Phab ', organic acids and flavour constituents of the beverage.

3. Technological—Preservation of beverage by carbonation and pasteurization etc.

These studies will also provide a scope in the production of this primitive beverage on large scale on modern scientific lines in these backward regions where industry is virtually non-existent.

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Non-Traditional uses of Sugarbeet*

K. L. Kapur[1], M. P. Agrawal[2] and V. P. Singh[3]

Introduction

At present sugarbeet is being grown in India mostly for experimental purposes. Complementary units at semi-commercial scale for sugarbeet processing in existing sugarcane factories have been set up at Sriganganagar (Rajasthan) and Phaltan (Maharashtra). There are proposals to establish a factory at Pantnagar in Nainital District for processing of sugarbeet alone. Nevertheless, disposal of beet crop is a serious problem prior to the establishment of a factory. Its utilization even as a feed is linked up with factory processing, since conversion into pulp will not be possible otherwise. Initial trials with green commercial crop as feed are not very encouraging.

Since beet roots possess acrid taste and disagreeable flavour, these could not be utilized for edible products in the past. This paper reports the efforts made to remove these defects and utilize them for the preparation of various products, namely, open pan sugar, beet juice, preserve, candy, jam, chutney, dried shreds and pickles.

Materials and Methods

The experiment was carried out at the Government Fruit Preservation Institute, Lucknow, U.P., on the initiative of Indian Institute of Sugarcane Research, Lucknow. The sugarbeet crop (Ramonskaya-06) was raised at the Farm of Indian Institute of Sugarcane Research, Lucknow. Roots (*Beta vulgaris* L.) of uniform and optimum size, i.e. of about 750 g weight were used for the experiment during May-June 1976. To get an idea of sugar content of sugarbeet, the total soluble solids were recorded with the help of hand refractometer. pH was measured by BDH pH indicator paper. Titratable acidity was estimated by titrating the root extract in water against standard NaOH solution and expressed as anhydrous citric acid. The sugars were determined by Lane-Eynon general volumetric method and tannin by Lowenthal permanganate method[1]. Pectin was determined as calcium pectate[2].

In order to remove the acrid taste and disagreeable flavour, number of pretreatments like effects of alum, lime, ascorbic acid, potassium metabisulphite (KMS) and blanching were studied.

After working out the chemical pretreatments to overcome the undesirable characteristics, efforts were made to utilize the beet roots for preparation of edible products namely preserve, candy, jam, chutney, pickles, dried shreds, open pan sugar and beet juice by conventional methods with necessary modifications. The products were assessed for their general acceptability by a panel of judges on the score card basis.

* The study was taken up as an inter-institutional programme of work between Indian Institute of Sugarcane Research, Lucknow (ICAR) and Government Fruit Preservation Institute, Lucknow (U.P.).

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[2]—Indian Institute of Sugarcane Research, Lucknow-2.

Results and Discussion

Analysis of sugarbeet: Sugarbeet (*Beta vulgaris* L.) is very much different in shape, size, colour, taste and flavour from red beet (*B. cruents*), which is popularly being used as salad and cooked vegetable. It is conical in shape with few root hairs. Outer skin is fleshy and dull in colour. On peeling or cutting the roots of the variety Ramonskaya-06, a reddish purple colour exudation appeared on the surface which changed into dark purple and then bluish black colour. The reddish purple colour may be due to mixture of anthocyanin pigments[3]. The changes in colour may be due to enzymic oxidation of 0-diphenol to corresponding 0-diquinone which subsequently changed to dark coloured compound melanin[4].

The acrid taste of the roots may be due to glucoside of some amino-anthocyanidin[3]. The texture of sugarbeet roots is relatively more hard and crunchy than other root crops which may be due to higher level of cellulose (about 1%).

The brix in expressed sap ranged between 20-23°. The major portion of the soluble solids comprised of non-reducing sugars (17.7%). The value of reducing sugars was 4.5%. The acid level was 0.16% and pH 6.0. The pectin was 2.0% and tannin content was 0.01%.

Effect of pre-treatments: None of the pre-treatments like dipping of beet roots in lime, alum, common salt and ascorbic acid checked the discolouration, disagreeable taste and flavour, except blanching for 15 minutes in boiling water. The off colour was checked by keeping the peeled and cut roots in 100 ppm solution of sulphur dioxide. This may be due to its combination with enzymically produced orthoquinone and the prevention of its condensation to melanin[5].

It was therefore decided that the peeled or cut roots should be dipped in 100 ppm SO_2 solution before processing it further for the preparation of edible products. Blanching was also resorted to wherever necessary.

Utilization of sugarbeet for edible products:

Brief account of various processes tested and now recommended for adaptation is given below:

Sugarbeet juice

For the preparation of liquid sugar or beet juice which may be utilized by pharmaceutical units, juice was extracted from beet roots by (i) pectic enzyme and (ii) hot water.

(i) Extraction by pectic enzyme

Beet roots were peeled and grated. The grated material was thoroughly mixed with pectic enzyme (0.4%) and allowed to stand overnight at room temperature. The mass was pressed by hand in a muslin cloth and then in a hand operated juice extractor. Juice was strained through a muslin cloth to remove extraneous matter. The extraction of juice was 60% and it was dark brown in colour having dull sweet taste. Brix of the juice was 10°. Acidity and pH were 0.16% and 5.5 respectively. Further concentration of juice to brix of 20° and 70° (syrup) resulted in a product which was disagreeable in colour, taste and flavour.

(ii) Extraction by hot water

Sugar was leached out by repeated hot water extraction of the peeled and grated sugarbeet roots. The hot water extracted juice was dull white in colour and sweet in taste. The composition of the juice was almost similar to the juice extracted by pectic enzyme.

The juice extracted by hot water was clarified by boiling with 1-2% alum solution. Alum coagulated the entire suspended matter and removed as scum from the surface of boiling juice. The juice was evaporated at boiling temperature to bring it to 20° brix. It was allowed to stand for one hour. The suspended material settled down leaving clear juice. Clarified juice was filled in well cleaned bottles which were pasteurized at 100°C for 15 minutes.

Another portion of the clear juice (20° brix) was concentrated to 70° brix. Beet syrup thus obtained was quite acceptable and may be utilized in place of sugar syrup by pharmaceutical and processing units.

Open pan sugar

The hot water extracted juice was utilized for the preparation of open pan sugar. The pH of the clarified juice (10° brix) was adjusted to 9.0 by addition of calcium hydroxide. The juice was concentrated to 80° brix. The mass was placed on a clean wooden tray. It was stirred vigourously with wooden laddle till the whitening of the material took place. The stirring was continued till the material dried up and crystalline mass was formed. The colour of the material was just like *khandsari* sugar made out of cane juice. It had acceptable *khandsari* like taste with mild off flavour.

Preserve

Sugarbeet roots were peeled and cut into small 2 cm cubes for convenient handling. They were kept immersed in 100 ppm SO_2 solution during this process. The cubes thus remained hard. They were blanched in boiling water for 20 minutes to make them sufficiently soft. The cubes were pricked all around thoroughly. The cubes were then smeared with layers of crystal sugar and kept overnight. The syrup of the exuded juice was gradually concentrated to 70° brix. The cubes were again added to the syrup. The preserve was then filled in wide mouth jars.

The taste, colour and softness of the preserve were similar to that prepared from other fruits like pumpkin (*Petha*). The shape of the cubes remained as such in the end product which is an additional advantage.

Candy

For the preparation of candy, the syrup of preserve was further concentrated to higher consistency (80-85° brix). The cubes were removed from the syrup. They were subsequently utilized for preparation of candy.

Jam

Sugarbeet roots were washed thoroughly, peeled and grated with a stainless steel grater. The shreds were kept in potassium metabisulphite solution for five minutes and after removal were cooked until the material became soft. Sugar was added to it in the ratio of 8 : 10 instead of equal sugar being normally used in preparation of jam from other fruits. Citric acid (0.5%) was mixed and whole mass was concentrated to higher consistency. This was filled in bottles. The jam can be coloured and flavoured according to taste.

In respect of colour, taste and flavour, the jam was similar to jam prepared from other fruits.

Chutney

Sugarbeet roots were washed, peeled and shreded and kept in potassium metabisulphite solution. On removal from potassium metabisulphite solution, shreded onion,

garlic and ginger were added to it. These were cooked for 30 minutes with small quantity of water to make them soft. Sugar, powdered spices, red chillies and salt were added to the cooked material and further cooked to higher consistency of 68-70° brix. It was mixed thoroughly with 0.1% acetic acid and filled hot in jelly jars. Chutney was good in taste, colour and flavour.

Dried shreds

Roots were washed, peeled and shreded. Shreds were kept in potassium metabisulphite solution for 15 minutes to impart sparkling white colour to it. These were then removed and potassium metabisulphite solution was drained off. Shreds were dried in cabinet dryer at 70°C for half an hour and sealed in polythene bags in order to keep them free from moisture. The dried shreds were like coconut shreds in taste and colour.

Pickles

Beet roots were washed, peeled and cut into small pieces. Pieces were kept in potassium metabisulphite solution during above operations. Material was blanched in boiling water for 15-20 minutes. These were subsequently mixed with salt and spices and small quantity of mustard oil. It was kept for 4-5 days for curing and then covered with mustard oil. It was filled in wide mouth bottles for subsequent storage. In another effort, mixed pickles with lemon and green mango slices were also prepared. Pickles compared well in taste with other pickles commonly available.

Organoleptic evaluation : Organoleptic test for all the products was done by a panel of four judges. All the products except the concentrated juice extracted by pectic enzyme method were very much acceptable and compared well with the similar products prepared from other fruits. The mean of four values scored by each product are given in Table 1.

As it is evident from the evaluation score card, jam and chutney were found to be very much acceptable. These hold good possibilities of being marketed along with other commercial products available in the market. The products like preserve and candy were rated next to jam and chutney and these can possibly be marketed as '*Dana*', a pro-

TABLE 1. *Organoleptic evaluation of processed products of sugarbeet*

Sweetened preparations	Mean score out of 100	Salted and sour preparations (pickles)	Mean score out of 100
1. Jam	75.75	9. Sugarbeet + lemon ..	65.75
2. Chutney	72.00	10. Sugarbeet alone ..	61.50
3. Preserve	63.75	11. Sugarbeet + mango ..	59.00
4. Candy	62.75		
5. Open pan sugar ..	60.20	S.E. = ± 1.835	
6. Dried shreds ..	58.00		
7. Sugarbeet juice ..	41.50		
8. Concentrated juice ..	23.25		
C.D. at 5% level ..	10.27		

duct made from pumpkin. *Khandsari* type sugar prepared from beet compared well in taste and sweetness with *Khandsari* made from cane juice. Until sugarbeet finds a place for crystal sugar production in India, sugarbeet can be utilized as a supplementary sugar crop for the manufacture of *khandsari*. The dried shreds of sugarbeet were sparkling white in colour and can be utilized as sweetened coconut shreds. Sugarbeet pickle mixed with lemon was found best among the pickles prepared.

Beet juice of 20° brix had slight off flavour but for which it was acceptable. It may be further improved and utilized as soft drink. The concentrated juice (70° brix) prepared from pectic enzyme method had malted flavour and dark brown colour which may be further improved.

At a reasonable price of 13 paise per kg for sugarbeet which is comparable with price of sugarcane, beetroot will provide a cheaper source of raw material for preparation of a range of edible products enumerated in this paper.

Summary

The acrid taste and disagreeable flavour of the sugarbeet were removed by blanching. The discolouration on peeling or cutting beet roots was checked by dipping in 100 ppm solution of sulphur dioxide. Sugarbeet was utilized for the preparation of eleven edible products. This opens a new line of work for the utilization of sugarbeet.

Acknowledgements

The authors are grateful to Dr. Kishan Singh, Director, Indian Institute of Sugarcane Research, Lucknow ; Dr. S. S. Teotia, Director ; and Dr. R. C. Garg, Physiologist, Government Fruit Preservation Institute, Lucknow, U. P., for encouragement and keen interest during the course of study. The useful suggestions given by Dr. S. C. Srivastava, Project Coordinator (Sugarcane), in the preparation of manuscript are gratefully acknowledged.

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Book Reviews

Food Products Formulary, Volume 3—*Fruit, Vegetable and Nut Products*, by D. K. Tressler and J. G. Woodroof, The AVI Publishing Company Inc., Westport, Connecticut, 1976, pp. 278.

This book is the third volume of a series of books on Food Products Formulary presenting formulas and procedures for making and preservation of a large number of commercial and institutional food products. This volume presents formulas and methods of making and preserving many different fruit, vegetable and nut products and sauces. These were collected by the authors from important companies producing fruit and vegetable products and those manufacturing ingredients used in making these products. Some of the formulas were developed in the authors' laboratories and others were published in AVI Publishing Co. books.

Recipes and procedure for the manufacture of various fruit, vegetable and nut products are covered under 19 sections. The first section deals with fruit beverages and purees of apples, apricot, banana, berry fruits, citrus fruits, grape, guava, mango, papaya, passion fruit, peach, pear, pineapple and tangerine. One of the interesting things in this section is the recipes and procedure for the preparation of fruit punch for different occasions like birthday party, Christmas, graduation, New Year eve, picnic, sweetheart punch, wedding etc. Mixed fruit beverage, canned acidified banana puree, chilled orange juice, frozen juice concentrates are also covered.

In section 2, brief description on the canning of apple, apple sauce, glazed apples, apricot, berry fruits, peaches, pears, pineapple (sliced, crushed), dried and fresh prunes has been included. Under section 3, ingredients and procedure for the preparation of fruit flavours, concentrates and essences have been described. This covers different fruit flavours, frozen apple concentrate, peach concentrate, orange oil extract, orange oil emulsions, flow sheet and diagram for still for essence recovery and juice concentrate recovery.

Section 4 deals with dried, dehydrated and dietetic fruit products. Brief description of dried apples, sun dried apricots, dehydrated and dried bananas and cherries, peaches, pears is given. Process flow diagram of a desiccated coconut plant has been described. Procedure for foam mat drying of citrus juices and osmovac dried fruits is given. Recipes for the preparation of dietetic gelatin dessert, preserves and jellies have been included which are normally not included in any fruit preservation books.

Procedure for the preservation of different fruits by freezing is given in section 5. Section 6 covers recipes and procedure for the manufacture of jams, glaced fruits, fruit syrups and sauces. Vacuum cooking of preserves and jellies and recipes for the preparation of instant jam mixes are the useful addition in this section. Procedure for preparing pectinized puree has also been included in this section.

Section 7 consists of recipes and procedure for the manufacture of fruit

butters, fruit sauces, spiced and pickled products. In the next section, interesting topic namely speciality fruit items and confections has been included. Under this, role of gelatin in specialities and confections has been described. Recipes for speciality products such as Ambrosia fluff, apricot nugget spread, cherry chiffon, coconut fig candy, cranberry crunch, different fruit pudding, jellied fruit dessert using low methoxyl pectin have been incorporated.

In subsequent sections, various products from different vegetables have been included. This includes vegetable beverages and purees, canned vegetables, dried and dehydrated vegetables, frozen vegetable products, vegetable base dressings and dips, vegetable soups, sauces and sauced products and speciality vegetable items. In section 11, flow sheet for beet dice dehydration, commercial dehydration of carrots, dehydrated garlic, flow sheet for onion dehydration, dehydrated bell peppers, flow sheet of general processing steps for potato products have been discussed in detail.

In section 13, regarding manufacture of pickles and chutneys, some more information could have been included. Important items like mango pickles and chutneys have not been discussed. However, recipes and procedure for the preparation of tomato chutney, cucumber pickles, dill pickles, gherkins, sauerkraut, watermelon pickle have been incorporated. Information on the preparation of vinegar is insufficient. Section 14 consists of number of recipes for the preparation of vegetable base dressings and dips. Among them Avocado dip, French, Italian and Russian dressings are important. In section 15, nearly 70 recipes for the preparation of vegetable soups, sauces and sauced products have been included. Recipes and procedure for the preparation of speciality vegetable items like baked beans, imitation catsup, meatless chilli, chop suey, chow chow, whipped garlic spread, hopping John, extruded onion rings, frozen potato puffs, potato products etc. have been discussed in section 16.

Sections 17 to 19 cover nut products which are not normally covered in any textbooks dealing with the preservation of fruit and vegetable products. This is a welcome addition in this book. Preparation of almond products and peanut products are covered in sections 17 and 18 respectively. In the last section, preparation of miscellaneous nut products such as chestnuts, filberts (hazelnuts), pecans and walnuts are discussed.

In the appendix, tables for cooking temperatures of water, boiling points of sugar solutions, data for preparing jellies conforming to federal regulations using fruit juices of different soluble solids concentrations, spice and herb chart, notes on how to use herbs, peppers, spices, seeds and seasoning, table for conversion of Centigrade degrees into Fahrenheit degrees and metric measurement conversions have been incorporated. At the end, subject index has been included.

This volume provides excellent compilation of recipes and procedures for the manufacture of fruit, vegetable and nut products. The book is very useful to the manufacturers of fruit and vegetable products, confectionery and bakery products, ice cream manufacturers, hotels, students of food technology, home science and research institutes. Printing, binding and presentation are excellent. But units of the recipes are given in British system which would have been given in metric system. However, conversion table is given at the end.

M. MAHADEVIAH

Systems Analysis for the Food Industry, by Filmore, E. Bender, Amihud Kramer and Gerald Khan, AVI Pub. Co. Inc., Westport, Connecticut, pp. 468.

Systems analysis, a tool for maximizing the profits, first recognized as a distinct discipline during World War II, is made use of extensively in the industries. The book under review presents in a single volume techniques and tools to formulate and solve mathematically the problems of food manufacturing industries using systems analysis approach.

Chapter 1 introduces the systems analysis and operation research. The importance of reliable data, their scarcity and pitfalls of the application of systems analysis research are discussed and readers are warned against these in preface, chapter 1 and at many places in the text.

Linear Programming (LP) is introduced in chapter 2, and its application to the problems of feed formulation, feed formulation with nutrient availability, sensory and other functional constraints are discussed in chapter 3. The concept of Integer Programming (IP) and its application in selection of product lines, products to manufacture or distribute, economics of size and market discounts are illustrated in chapter 4. Algorithms for developing a computer programme to solve LP and IP problems are given and discussed at the end of chapters 3 and 4.

Regression analysis, analysis of variance (ANOV) and evolutionary operation (EVOP), a popular and powerful tool used for the continuous improvement of an operation, are presented in chapter 5. The control of production by optimal utilization of men and machinery is discussed in chapter 6. Sequencing the operation, inventory control and budgeting in food industries are important because the raw material and finished products of food industries may be seasonal and perishable, and there may be tremendous difference in their availability and cost. These problems are the subject matter of chapter 7. Chapter 8 deals with the optimal solution of the problems of (i) transportation, (ii) assignment, (iii) trans-shipment and (iv) waiting lines. The examples given in this chapter illustrate the use of individual simple problem's solution in solving a complex model. Chapter 9 discusses the use of Programme Evaluation and Review Technique (PERT) and Critical Path Method (CPM) in planning and scheduling the activities of a project. Break-even analysis is discussed in chapter 10. Chapters 11, 12 and 13 include sales forecasting, game theory and some more applications of LP respectively.

A number of solved examples are given throughout the text to illustrate and guide the reader step by step to formulate and solve mathematically the problems of food manufacturing systems using systems analysis approach. The examples are illustrated with charts, tables and graphs in each chapter. Summaries at the end of each chapter help the readers to follow the steps involved in solutions. Techniques and algorithms to solve the problems by using computer are discussed. Algorithms given are well explained and one can get workable knowledge. The appendices, references and suggested further readings given at the end of each chapter make the book complete. According to the authors, this book is essentially written to meet the needs of managers, technologists and students in the field of food processing to apply the knowledge of systems analysis to find out the optimal solutions to their problems, and for systems analysts to provide them an insight into the

problems of food industries to apply their know how to find out optimal solutions.

The book is complete within the limits. An additional introductory chapter on algebra, matrix, calculus and a little more mathematical treatment of the techniques used would have been better. On the whole aim of the authors to provide with an insight into the opportunities of application of systems analysis in the food industries to professional systems analysts, food managers, technologists and students is well achieved. This is a good ' teach yourself ' book and is recommended for institutional and personal libraries.

M. C. MISRA

Poultry Products Technology, II Edition, by George J. Mountney, The AVI Publishing Company INC., Westport, Connecticut, 1976, pp. 369.

This book after second revision has assumed a new look in its appearance and its contents. Now the book contains twenty-three chapters including four additional chapters on egg and egg products and one chapter on analysis of egg and egg products.

The author has vividly described in the first chapter, the development of poultry industry in U.S.A. in which breeding, feeding, management and need for technology are briefly discussed.

Detailed description on poultry meat has been made in chapters II-VI, VIII and IX. As the poultry meat becomes highly popular, the author emphasized the importance for grading and measurement of yield characters of meat, and loss during processing and marketing. Preservation of meat needs some knowledge of microbiology. The organisms responsible for pathogenecity and spoilage are clearly enumerated alongwith some techniques to find out titre in different poultry products. In chapter VIII, he has discussed in detail the layout of poultry processing plant with model design, water supply, sewage disposal and plant sanitation. Environmental pollution is one of the major hazards faced by human beings. This aspect did not escape attention of the author also. Canning of poultry products has definite advantages. The recipes described in chapter XI will be appreciated especially by housewives. One of the common methods employed in modern times to preserve animal products is the freeze drying. Effects of freeze drying of poultry meat has been described with regard to nutritive value, economics and marketing in chapter XII. Other methods of preservation like curing and smoking are discussed in detail in chapter XIII. In chapter XIV, the author has discussed in detail irradiation of poultry meat and its effect on shelf-life. As any other industry, the poultry industry also produces several inedible by-products like manure, feathers, blood offal, egg and egg shells. Processing of these inedible by-products has been discussed in chapter XVII. Physiology of egg formation and different quality traits of eggs are discussed in chapters XVIII and XIX alongwith quality measures adopted in U.S.A. Factors affecting egg quality traits, physico-chemical characters and processing of different egg and egg products are detailed in chapters XX, XXI and XXII, respectively. Last chapter contains tests for analysis of egg and egg products. The author has listed different useful biochemical and microbial tests which help in assesing quality of egg and egg products.

Thus, this book gives a comprehensive account of principles involved in the poultry products technology and industry,

It will be useful to those engaged in poultry industry as well as the students of poultry product technology.

However, the book is enriched with sketches, photographs and other illustrations which will greatly help the readers to get clear idea about the subject. The valuable information is presented in many tables, to make this book most useful one.

B. PANDA

Potato Processing, Third Edition, edited by W. F. Talburt, M.S., and Ora Smith, PH.D., The AVI Publishing Company, Inc., Westport, Connecticut, 1975, pp. 715, US$. 40.00.

The editors have done an excellent job of bringing out information on all aspects of potato processing in a single volume. The book itself is a compilation of articles by experts in this field. Potato forms a major food item in the developed countries and is to play a significant role in the basic needs of developing countries.

The first eight chapters deal with the history, structure and chemical composition, varieties, effect of cultural and environmental conditions on potatoes for processing, disease, sprout inhibition, transit and storage conditions and nutritive value. The information gives an insight of the basic requirements of potatoes for processing. Suitable varieties grown in North America are tested. Obviously, other countries will have different varieties. While giving the structure and chemical composition, the effect of important chemical constituents in relation to processing and utilization has been highlighted. Important constituents are starch, sugars, phenolic and related substances, chlorophyll, solanine and protein. Number of factors contribute to quality of potato for processing such as specific gravity, total solids, starch content, sugar content, reducing sugars, disease, maturity, size, shape and peeling loss. Correlation of these factors with cultural practices like variety, date of planting, soil temp., soil reaction, soil moisture, season, location, fertiliser application, time of harvest is well brought out. The extensive work should prove very useful to others intending to start potato processing. Though the transit and storage conditions differ from country to country, the description of handling methods is useful to all.

Chapters 9 to 20 are important from a processor point of view. These chapters deal separately with all aspects of manufacture of important potato products.

Potato chips : Important points like yield, colour and oil content of chips and the factors which affect these points are discussed in detail. Technology for large scale chip production is described.

Frozen French fries and other frozen potato products : There is a phenomenal increase in commercial products of these items in U.S.A. and Canada. Factors affecting the quality, such as variety, storage conditions, starch changes, physiological and pathological conditions are discussed. Manufacturing process is described.

Dehydrated mashed potatoes—Potato granules: This is a dehydrated product with 6-7% moisture. Cost is moderate due to the nature of the process of manufacture and high bulk density resulting in minimum cost of purchase and shipping. Present status of this industry and its problems in U.S. are discussed.

Potato flakes : These are dehydrated mashed potatoes drum dried to desired moisture content and cut to required size. Method of its manufacture is discussed in detail. It is also produced in many European countries.

Other products whose requirement of raw materials, techniques of manufacture and quality problems discussed are dehydrated diced potatoes, potato starch, potato flour, canned white potatoes and pre-peeled potatoes. A chapter also gives short description of miscellaneous products from potato and another for potato products for livestock feed. A chapter gives methods of waste disposal. Considering the increasing pollution problems, it is a very useful information.

As these are review articles, large number of references are available for scientists wanting to go into details of the work done in a particular subject.

Potatoes can be grown all over India. There is a great need for a processing industry. In that context the book is useful to scientists and future processors.

S. V. DRAVID

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The following Canning machinery are available for sale :

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Notes and News

- *ICICI—World Bank Loan*
- *Assam: Agricultural Project*
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- *World Cereal Stocks*
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ICICI—World Bank Loan

The World Bank has announced a loan of US $ 80 million to the Industrial Credit and Investment Corporation of India (ICICI), a Development Finance Company. The loan will help finance the foreign exchange cost of ICICI's investment in productive enterprises.

The World Bank has been closely associated with ICICI since its inception in 1955. This long association has resulted in substantial bank resources being channelled to priority investments in India's private industry. The Bank also has been partner in ICICI's institutional development by supporting continuing improvements in project appraisal, supervision and evaluation, and by encouraging wider geographic dispersion of ICICI's investment.

The Bank loan of US$ 80 million is the twelfth to ICICI and brings the total of such assistance to US$ 505 million. It will help meet ICICI's foreign exchange requirements through 1979. The loan to ICICI will have the guarantee of the Government of India and carry interest at the rate of 8.2 per cent. It will be for a maximum of 17 years, including three years grace, to be adjusted according to the amortization schedule of sub-projects.

Assam: Agricultural Project

The International Development Association (IDA) is providing a credit of US$ 8 million to help finance an agricultural development project in the State of Assam.

The project will help to improve agricultural extension services in eight of Assam's districts containing about 97 per cent of the population, and lay the base for improvements in groundwater development.

The five-year project was prepared by the Government of Assam with assistance from the Food and Agriculture Organization World Bank Co-operative Programme. It provides for a complementary package of components designed to achieve early and sustained improvement in agricultural production by strengthening extension and research services, so as to bring proven agricultural practices to farmers living on the plains districts of Assam.

The project covers the two valleys of the Brahmaputra and the Barak, where most of the State's annual crops are grown, including rice—the most important crop and other commercial crops, including tea, oilseeds, jute and sugarcane.

Under the project, which is estimated to cost a total of $ 16.4 million, a well-trained, highly motivated and technically competent extension organization will be created to give farmers practical technical guidance aimed at increasing production and incomes.

The benefits of the project include an increase in crop yields, and over the five years, it will directly benefit about 200,000 'Contact' farmers and through them, at least one million farm families, primarily small farmers with limited financial resources, but excess labour.

As a result of the improved efficiency in utilization of resources through the project, it is calculated that by year Seven, the state of Assam's production of rice could increase by about 43,000 tons.

Evaluation of Food Additives

Evaluation of Food Additives, 12th Report of the Joint FAO/WHO Expert Committee on Food Additives, held in Rome, 21-29 April 1976, pp. 32, by the Food and Agriculture Organization of United Nations, Rome, is available in India from Oxford Book and Stationery Co., Scindia House, New Delhi; 17 Park Street, Calcutta.

FAO of UN, Rome, will issue separate monograms containing summary of data on 'toxicological evaluation of certain food additives' and 'specifications for the identity and purity of certain food additives'.

The report gives the outline of general considerations on the modification of agenda ; the importance of information on food additives and contaminants to developing and developed countries ; general principles for toxicological evaluation ; premature replacement of suspect chemicals by less tested substances ; evaluation and re-evaluation of specific food additives ; review of specifications ; and chemically modified starches ; priority for evaluation of flavouring substances. The annexures contain the report and documents resulting from previous meetings of the joint FAO/WHO Expert Committee on food additives; acceptable daily intakes and information on specifications ; toxicological studies and the use of therapeutic and antimicrobial substances.

FAO/WHO Codex Alimentarius

The FAO/WHO Codex Alimentarius Commission was established to implement the Joint FAO/WHO Food Standards Programme. Membership of the Commission comprises those Member Nations and Associate Members of FAO and/or WHO which have notified the organizations of their wish to be considered as Members.

The purpose of the Joint FAO/WHO Food Standards Programme is to protect the health of consumers and to ensure fair practices in the food trade ; to promote co-ordination of all food standards work undertaken by international, governmental and non-governmental organizations ; to determine priorities and initiate and guide the preparation of draft standards through and with the aid of appropriate organizations ; to finalize standards and after acceptance by governments, publish them in a Codex Alimentarius either as regional or world-wide standards.

The methods of analysis have been adopted by the Codex Alimentarius as international referee methods for a number of individual Codex standards for processed fruits and vegetables. These methods of analysis are not necessarily intended to replace routine methods of analysis, but are for acceptance and use as international referee methods of analysis by governments for the settlement of international disputes.

The full text of the General Principles of the Codex Alimentarius is contained in the Second Edition of the Commission's Procedural Manual (Ref. No. CX 8/7—1969).

Agriculture, Food and Biology (Vol. 1, 1977) published quarterly containing information on Conference Reports published by Applied Science Publishers Ltd., Rippleside Commercial Estate, Ripple Road, Barking, ESSEX, 1G11 OSA, England.

Conferences on scientific, technical and academic interests are held at venues

not easily accessible to the interested person. The aim of 'Conference Reports' is to bring all the papers with details presented at conferences to the reader.

A conference of Agrochemicals in Soils was held at Jerusalem during June 1976. The proceedings have been published by Springer-Verlag's Heidelberger, Plantz 3, D-1000 Berlin-33, Federal Republic of Germany.

The 3rd International Biodegradation Symposium was held at the University of Rhode Island, U.S.A., in April 1975. The proceedings have been published by Applied Science Publishers Ltd., England.

The 4th European and Mediterranean Cereal Rusts Conference was held in Switzerland during September 1976. The proceedings are published by the Swiss Federal Research Station for Agronomy, CH-8046, Zurich-Reckenholz, Switzerland.

The Second European Ministerial Conference on the Environment was held in Brussels, Belgium, in March 1976. The proceedings are available from the Council of Europe, 67006, Strasbourg, Cedex, France.

The International Symposium on Floriculture, Plant Breeding and Genetics was held at Michigan State University, U.S.A., during August 1976. The proceedings are available from the International Society for Horticultural Science, Ministry of Agriculture/Fisheries, Bezuidenhoutseweg 73, The Hague, The Netherlands.

The Symposium on Intermediate Moisture Foods was held at National College of Food Technology, Weybridge, Surrey, England, during March-April 1976. The proceedings are available from Applied Science Publishers Ltd., England.

The International Conference on Managing Saline Water for Irrigation was held at the Texas Technical University, Lubbock, Texas, U.S.A., during August 1976. The proceedings are available from International Centre for Arid and Semi-Arid Land Studies, Texas Technical University, Lubbock, Texas, U.S.A.

The Second British Nutrition Foundation Conference—entitled 'People and Food Tomorrow' was held at Churchill College, Cambridge, England, during April 1976. The proceedings are available from Applied Science Publishers Ltd., England.

World Cereal Stocks

A whopping increase in carryover stocks of cereals is predicted by the Global Information and Early Warning System of the Food and Agriculture Organization (FAO).

FAO forecasts a carryover of 163 million tons at the end of the 1976-1977 season—some 40 million tons more than last year and the equivalent of about 18 per cent annual consumption. Moreover, say FAO commodities specialists, stocks may go even higher next year, if 1977 reaches the levels now expected.

The 163-million-ton-figure does not include the U.S.S.R. and China, for which figures are not available.

The improved food situation, the FAO Council noted last month, provides an opportunity to build national reserves so as to avoid a repetition of the food crisis of 1972-1974.

The world outlook for wheat and coarse grains is on the whole promising. With favourable weather conditions in the United States, Canada and the U.S.S.R., FAO now predicts production in 1977 will reach 1,119 million tons only about 12 million or 1 per cent below last year's record.

There are still many trouble spots in developing countries around the world, especially in North Africa and the Near East. As examples of problem areas FAO states that heavy drought damage has hit the wheat crops in Algeria, Morocco and Tunisia.

Regarding milk production, FAO predicts an increase over last year. An excess of production over commercial outlets will continue to require costly surplus disposal measures, particularly in the European Economic Community, some other Western European countries and the United States.

FAO noted a favourable factor for the surplus dairy producing countries in the booming expansion of exports to the petroleum exporting countries. In recent years, dairy product imports by the oil-exporting developing countries more than doubled, and FAO estimates that these imports will reach about 3 million tons of milk equivalent in 1977.

Indian Association of Industrial Editors

The 18th Annual General Meeting of the Indian Association of Industrial Editors was held on 29th June 1977 at Hotel Bombay International. Shri R. S. Pandit in his presidential speech reviewed the work during the year and highlighted the important features of the forthcoming programmes one of which is ' How are you going to communicate ', which will form subject matter of the 9th Annual Convention and coincides with the 20th Anniversary Celebration and Exhibition of Indian and Foreign House Journals scheduled from 22-24 September 1977.

The following were elected office-bearers :

Mr. R. S. Pandit—*President*
Mr. J. D. Sunthankar—*Vice-President*

Members

1. Mr. S. N. S. Dikshit
2. Mr. S. Y. Potdar
3. Miss C. de Souza
4. Mr. H. K. Mathur
5. Mr. S. R. Rajan
6. Mr. M. Sundaresan
7. Miss P. P. Shivdasani
8. Miss Ronjona Mukarji
9. Mr. R. L. Patnaik

Punjab—' Sangam ' of Sutlej and Beas

The waters of the Sutlej and the Beas mingled together at Slapper in Himachal Pradesh on July 10 and flowed into the Gobind Sagar lake of the Bhakra complex marking the realisation of an ambitious dream. The Rs. 380-crore project had taken 12 years to be completed, the man-made confluence of the two major rivers.

This gigantic scheme would help provide much-needed power to the northern states besides irrigation facilities to Punjab, Haryana and the deserts of Rajasthan.

The Beas waters were released from Pandok dam on July 7.

About 35,000 workers and 2,500 engineers worked day and night to complete the greatest engineering feat of diverting the Beas waters into the Sutlej through two tunnels of 13 km each linked by a 12 km long open channel. The tunnels have a diameter of about eight metres.

This is the first project in India which was conceived and executed by Indian engineers.

Export Marketing Management

The Indian Institute of Foreign Trade has started conducting an evening course on export marketing management for Defence personnel. The first programme was concluded on 29th April 1977. Major General G. N. Sinha delivered the valedictory address and distributed certificates. General Sinha expressed that

a large number of Defence personnel received almost Rs. 1 lakh towards retirement benefit. He suggested to them to enter into export business on their own with the help of these courses. On a suggestion of the Defence services, the Institute has agreed to organize diploma courses instead of certificate courses.

Management Development Institute

The Management Development Institute, A-21 Palam Marg, Vasant Vihar, New Delhi-110 057, is an autonomous body sponsored by the Industrial Finance Corporation of India and registered under the Societies Registration Act, 1860. It provides training for modern management techniques ; training for development banking ; undertakes research in industrial and business management, development banking and related subjects.

The Management Development Institute seeks to fulfil the needs of industry in the fields of management development and research to promote application of management science to industrial organizations. The faculty is drawn from practitioners in different areas of management who have academic base with managerial experience. The Board of Governors consists of a wholetime Chairman and twelve members including the Chairman and the General Manager of Industrial Finance Corporation of India (IFCI) ; Kreditanstalt for Wiederaufbau (KFW) ; Industrial Development Banking Institute (IDBI), Ministry of Finance ; Director-General, the Council of Scientific and Industrial Research (CSIR) ; and six representing business and industry and financial, promotional and management institutions.

TULIP PRODUCTS COMPANY

IMDAD ALI LANE
CALCUTTA-700 016
Phone : 24-5948

B. O. SANATNAGAR
Srinagar-5, KASHMIR
Phone : 4032

FRUITS : Pears, Peaches, Cherries, Strawberries, Fruit Cocktail, Victoria Plum, Greengage, etc.

VEGETABLES : Asparagus, Sauerkraut, Baked Beans, Dil Gherkins, Garden Peas, Mixed Vegetables, etc.

SOUPS : Tomato, Vegetable, Celery, Mushroom, Pea, etc.

JAMS : Strawberry, Raspberry, Redcherry, Apricot, Pineapple, Mixed Fruit, etc.

SQUASHES : Orange, Lemon, Mango, Pineapple, etc.

And also Sauces, Jelly Crystals, Peanut Butter, Pearl Onion, Salmons, etc.

Export News

- *Freight Investigation Bureau*
- *Indo-Soviet Shipping Agreement*
- *Gelatine*

Freight Investigation Bureau

The Ministry of Shipping and Transport has set up a Freight Investigation Bureau at Kandla with effect from 12th May 1977. Similar Bureaus have been set up at Bombay, Calcutta, Madras, Cochin and Visakhapatnam.

The principal functions of the Bureau are to assist the shippers to sort out their day-to-day shipping space problems and arrange for adequate shipping coverage from the ports in India to the overseas destinations, besides looking into their freight difficulties.

Indo-Soviet Shipping Agreement

As a result of the Indo-Soviet negotiations held in March this year, the number of sailings between the two countries have been increased to 84 Westbound and 72 Eastbound.

Due to increase in the cost of operation of vessels, freight rates were increased by 12½% over the earlier prevailing rates.

The bunker surcharge has also been raised by 1.5% due to increase in bunker prices at many ports.

Gelatine

The Indian Institute of Foreign Trade, New Delhi, conducted a survey in France, Belgium, West Germany, U.K. and the Netherlands who are the major consuming countries in West Europe for the Indian Ossein and Gelatine. India has a surplus of about 80,000 tonnes per annum and the industry depends on exports for its survival and growth in view of stagnant domestic demand. The Indian Bone Industry also faces similar problem due to decline in demand from West Europe, though the Indian Bone Industry has a better quality of product.

The main reason for the lack of demand for the Indian products is existence of a well established Ossein Industry in West Europe and supply arrangement for bones. West Europe exports sun dried bone Gelatine and also green bone and skin Gelatine. The Indian Industry can supply only sun dried bone Gelatine. The survey observes that these limitations will create serious marketing problems in case of addition to the capacity besides that of procuring sufficient raw materials indigenously. Gelatine is mostly used in photography, pharmaceutical and food industries and in some small quantities in chemical and allied industries.

Foreign News

- *U.K.—Quest for Ideas*
  FIE—Foodpack 1977
  High-Speed Labelling
  Morgan Fairest and Albro
- *U.S.A.—Tap Tone*
- *UNDP—Opportunity for Developing Nations*
  Increased Contributions
- *Canada—Shipping Services*
- *West Germany—Aid-India Club*
- *Switzerland—Honey Market*
- *Italy—International Fair*
- *The Netherlands—Machevo-Milieu—78*
- *Bahrain—Congestion at the Ports*
- *Iran—Elimination of Congestion at the Port*
- *Dubai—United Arab Emirates*
- *Yemen—Floating Dock*
- *Bangladesh—IDA Aid*
- *Pakistan—ADB's Special Fund*
- *Mauritius—Import Regulation*
- *U.S.S.R.—Environmental Education*
- *Nepal—ADB Assistance*
  Highway Project

U.K.

Quest for Ideas

A Nation-wide Search for bright ideas is now being conducted under an incentive award scheme supported by the Food Manufacturers' Federation and by major British food firms.

The scheme is aimed to reward efficiency and improve health and safety standards in food factories throughout the country.

Open to all factory personnel involved in food manufacturing, it offers awards for the most outstanding ideas on two fronts : Manufacturing, Packaging and 'good housekeeping'—which may include ways of saving on energy and reducing waste, health and safety such as noise abatement, dust control, and the prevention of industrial accidents.

Object of the scheme is to make a worthwhile contribution to British industry, as well as provide inventive interest on a group industrial basis for employees throughout the food manufacturing field.

The scheme is being launched in the Royal Jubilee year and will be known as 'The Food Industries Jubilee Awards Scheme'.

The awards will be made biennially and the trophies held by the firms employing the award winners for two years.

Each of the two winners will receive a solid silver trophy, plus the choice of a fortnight's summer or winter holiday for two. The prizes are to be presented at the 10th International Exhibition for the Food and Allied Industries—more familiarly known as FIE-Foodpack—which takes place at Olympia from November 15-18, 1977.

The awards scheme is being run by a specially appointed committee—the Food Industries Jubilee Awards Committee—who will be responsible for the judging of entries.

The Committee comprises senior executives representing Batchelors Foods, the Beecham Group, Quaker Oats and Spillers Foods, as well as the Food Manufacturers' Federation.

The Chairman is Dr. J. G. Chadwick of Spillers Foods and the joint honorary secretaries are Mr. Howard Evans of the Food Manufacturers' Federation, and Mr. Donald Brooks of FIE-Foodpack.

The scheme will be administered by BPS Exhibitions, the organisers of FIE-Foodpack, on a voluntary basis.

FIE—Foodpack 1977

The 10th International Exhibition for the Food and Allied Industries—FIE-Foodpack—takes place at Olympia from November 15-18.

The event has special significance as it marks a period of service to food manufacturers spanning 20 years.

The biennial series has achieved success through its lively presentation of important developments in food processing, packaging, handling and distribution.

New and improved products introduced by FIE-Foodpack exhibitors have stimulated trends in food production and packaging that are today universal practice. And this year's event will be no exception in terms of new developments.

The exhibition shows the latest machinery and equipment designed to increase production and lower costs in all types of food factories. High speed weighing and process control systems handled by computer-fed information are featured. Also likely to capture considerable interest are recycling systems for food and water.

FIE-Foodpack reflects a number of significant changes in food distribution and retailing. On show will be new product coding and labelling systems and automated checkout systems, as well as cage pallets that allow pre-priced packaged foods to be delivered from point of production straight to the point of sale.

Another significant trend to be seen at FIE-Foodpack arises from the growing ownership of home freezers over 100 per cent last year. This has led to changes in the distribution of fresh fruits and vegetables.

Purchases are now being made from the source of supply in bulk packs rather than in unit packs—which means that substantial preparation and treatment of produce are required after careful inspection to ensure quality consistent with premium prices.

Many hundreds of packs and packaging materials will be shown, including cartons, trays and films for use in most sections of the food industry. Widely represented will be vacuum packaging, stretch film wrapping and over-wrapping machines, as well as many different types of cartoners for erecting, filling and sealing.

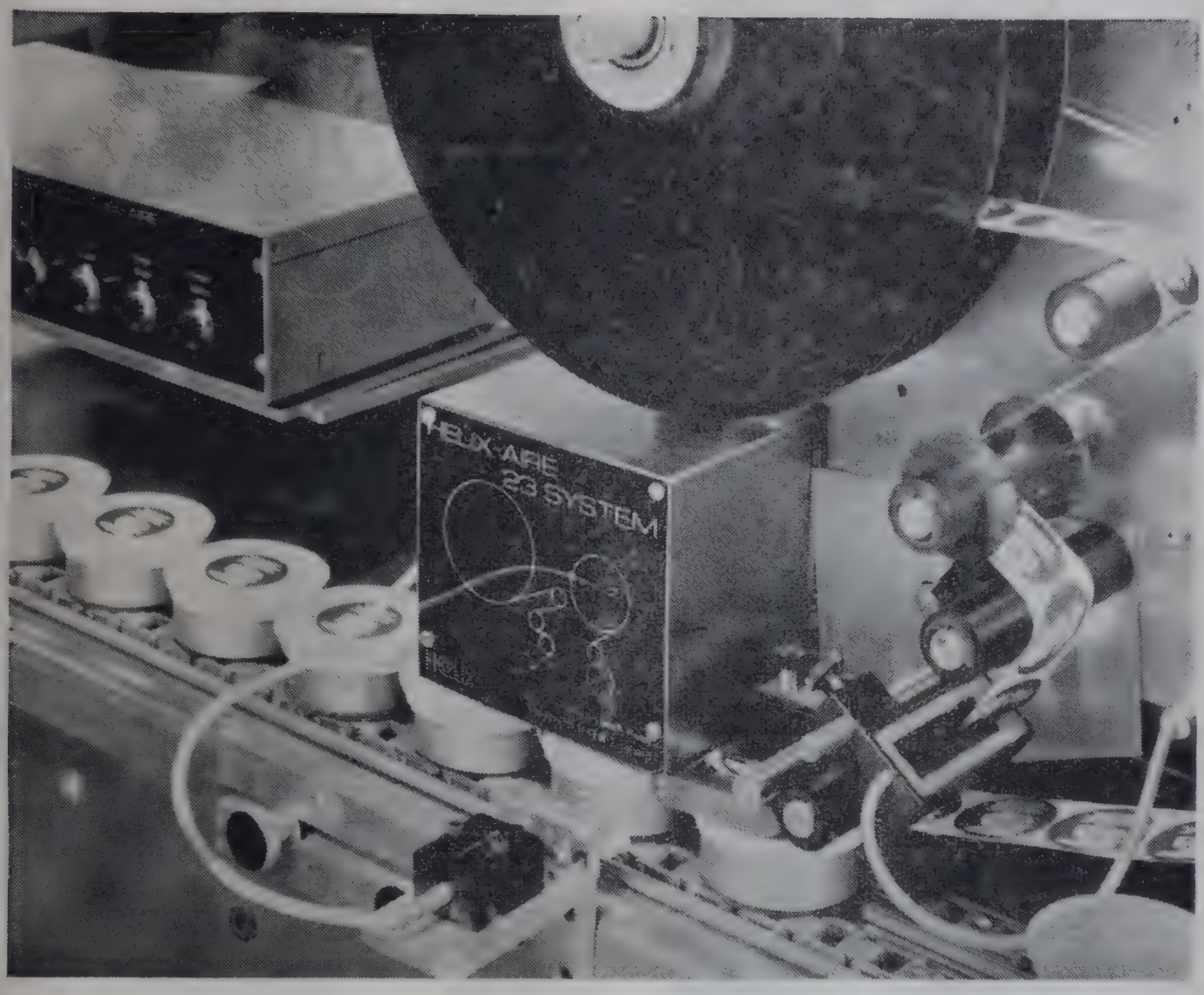
A huge range of other exhibits offer improved low cost methods of manufacturing and handling. The range includes equipment for collating, grouping, loading, conveying, elevating, storage and stacking.

High-Speed Labelling

A new labelling head developed by Helix Materials & Systems Ltd., 545 Ipswich Road, Slough, Berkshire SL1 4EN, England of Slough, England, for their air-operated high-speed labelling systems can for the first time accept double-sided rolls of self-adhesive labels (photograph)—stripping the labels from each complete side of the backing-web in turn. This halves the number of rolls required. A significant part of the cost of self-adhesive labelling stems from the throwaway backing-web, only one side of which is normally used.

The new 'Gemini' head can also handle butt-cut labels as well as the usual die-cut type. Elimination of the 1/8 inch (3 mm) gap between labels provides further savings of up to one roll in five.

Helix-Aire 23 labellers fitted with the Gemini head can apply labels measuring from $\frac{1}{2}$ in. $\times \frac{1}{2}$ in. to 3 in. $\times$ 5 in. (from 12 $\times$ 12 to 75 $\times$ 125 mm) at speeds up to 1500 linear inches (38,000 mm) of label web per minute. At present the special double-sided rolls of labels, known as 'Dubl-Ply', are available only from Helix



themselves. However, the company is currently seeking overseas distributors for its products and hopes to come to arrangements with existing printers of self-adhesive materials in different countries.

With the Gemini head, the Dubl-Ply labels are stripped from one side of the backing-web during the first pass, the web being rewound on a take-up reel so as to expose the labels on the other side. Subsequent transposition of take-up and feed reels enables the remaining labels to be stripped during the second pass. A special roller replaces the normal acute-angled peeler bar to prevent damage to the underside labels during the first pass.

As the label becomes detached, it slides across the perforated front of an airbox, held by a light vacuum. Then, as the product approaches, a line-mounted photocell triggers a short air-blast which is applied, through tubes, to selected perforations in the airbox. This projects the label into the product, through a distance of up to 1 inch (25 mm). The machine's clutch/brake assembly then feeds the next label into the airbox. With the standard head, using single-sided rolls of die-cut labels, the advance mechanism is halted by photo-electric sensing of the gaps between labels. No such gaps exist with butt-cut or Dubl-Ply labels, and label advance is halted with the Gemini head, after a precisely adjustable distance corres-

ponding to label length. Correct position is ensured by adjusting the leading edge of the first label delivered from the roll.

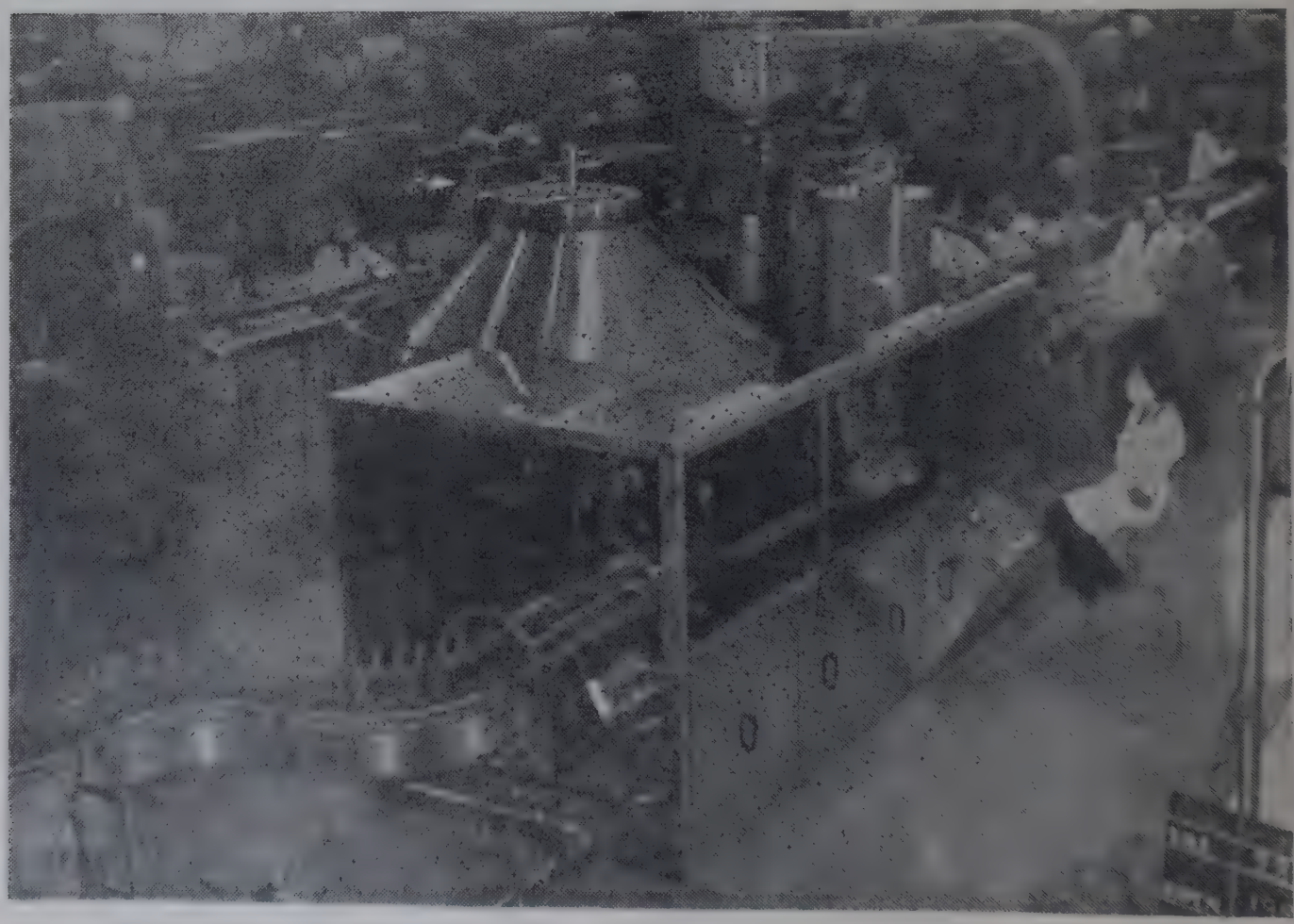
The air-blast labelling system, which required no contact between the applicator head and the product, can operate at any angle to label awkwardly shaped packs. Placement accuracy is ±1/32 inch (±1 mm), even at maximum speed. Information such as prices or stock codes can be overprinted on to labels immediately before delivery by means of hot-foil or ink printing-heads or a new alphanumeric coder employing computer printout technology.

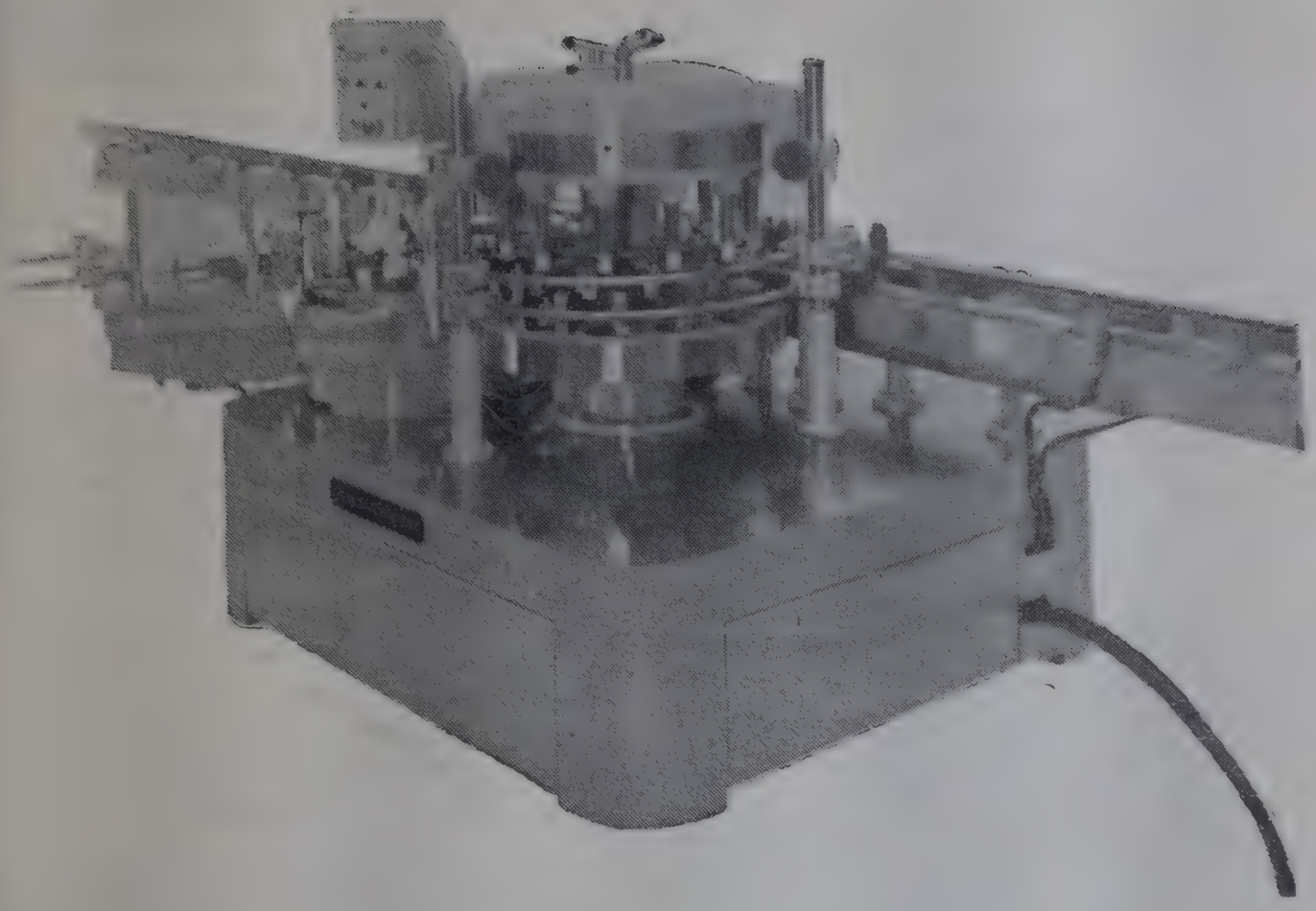
Morgan Fairest and Albro

The MONOBOTTLER, a machine, for cleaning, filling and capping glass containers for a wide range of non-carbonated, free-flowing products, such as whisky, gin, fruit juices, will be on display at INTERBRAU, MUNICH. The equipment is manufactured by Morgan Fairest Limited, Fairway Works, Carlisle Street, Sheffield S4 7LP, England.

This new development is controlled by one operator and replaces the three separate machines normally used to carry out these operations. The machine is self-contained and includes an electrical printed circuit flow control system, which automatically adjusts and maintains the machine at its optimum speed, based on the rate at which glass and product are supplied, at speeds of up to 300 per minute.

Operational advantages gained by the MONOBOTTLER are a saving of up to 30% in floor space, a reduction of operators, and the elimination of breakages by the close control of irregular shaped bottles which are often found in the Distillery Industry.





The MF ' N ' 450 is a versatile machine, capable of applying body, body and neck or body, back and neck labels. The standard machine exhibited will have included a foiling attachment which will apply pre-cut foils from the stack to bottles up to 70 mm diameter. This attachment is easily removable to allow bottles in excess of 70 mm to be labelled without foil.

U.S.A.

Tap Tone

Tap Tone analyses variations in vacuum or pressure inside containers with metallic closures without touching the container. By transmitting an electromagnetic pulse to the metallic closure, a tone in the form of a ' ping ' is produced; if there is a change in vacuum or pressure from the normal condition, the pitch of the tone changes. This change in tone can be sensed by ear or, in the case of automatic Tap Tones, is sensed by electronic discriminators which can operate rejectors, mark defective containers, or sound an alarm.

A single hand-held transducer with a twelve-foot long cable is used for spot checks, product sampling, lab work, and rework on containers in sealed cases, eliminating the needs to open the cases to inspect the containers. Simple controls vary the rate and intensity of tapping, and speeds up to 4 containers per second can be attained by an experienced operator. If the Model 4050 Discriminator accessory is purchased, both a light and audible alarm signal a defective container. An output is provided for an external alarm signal. A convenient one knob set-up adjustment with a reference scale is used to provide the degree of

rejection required, depending on the product tested. The Discriminator eliminates operator errors due to poor judgement, fatigue or inattention.

The scanning head of the Portable Case Scanning Tap Tone, Model 4049-4, and the companion Portable Case Scanning Discriminator, Model 4050-4, are passed over the sealed case, or mounted above a slow-speed conveyor belt.

Different plug-in heads for all popular case sizes are available. A proximity sensor in the head automatically triggers the inspection process when the containers are properly positioned. Manually operated markers to indicate the location of a faulty container are included as standard equipment. With a Case Scanner an operator can inspect up to fifteen, 24-container cases per minute. If the optional Model 4050-4 Discriminator is used, defective containers are found automatically. Lights indicate the position of the defective containers within the case. An optional marker actuator controlled by the Discriminator is available to mark the defective container location automatically.

The simple controls, the wide variety of options, and the portability of this system simplify case inspection.

Complete, sensitive, fully automatic 100% inspection of containers in sealed cases is available with the Automatic Case Tap Tone, Model 4055-4. The need to open sealed boxes has been eliminated. This equipment not only offers a manufacturer an effective method of inspecting products after casing, but will provide inspection of warehoused product just prior to shipment.

A light display continually indicates the relative vacuum or pressure of the containers inside the sealed case. Below each light is a switch that controls the rejection level desired. If a defective container is found, a light is lit according to the location in the row, the electronic flash alarm on top of the unit signals, and a reject pulse is generated.

The high-speed system can check up to fifty, 24-container cases per minute. Options include container counters,either total or reject count, automatic markers, and case rejectors.

If different container sizes are to be checked, the transducers can be spaced according to the packing pattern, and plug-in circuit modules can be changed. This makes for rapid changeover and low maintenance costs.

Every effort has been made to ruggedize construction. Sealed, waterproof housings to NEMA-4 standards can take the punishment of high humidity, steam and production line wash down.

The Automatic Line Tap Tone performs 100% inspection on containers running by in single file at speeds up to 1500 containers per minute. Any defective container is automatically rejected. This equipment will detect and react to vacuum or pressure problems before products are cased.

A light display showing relative vacuum or pressure constantly indicates the conditions within the sealed container. A system of switches is provided to select the rejection level desired for a given product.

When a defective container is found, the electronic flash on top of the unit signals and the air-operated ram rejector operates automatically. Optional counters are available for total and reject count.

Quality construction techniques and ease of installation have been designed into this versatile equipment. No modification to the conveyor is required except to remove a piece of the guide rail to allow the containers to be pushed off the line. Sealed stainless steel waterproof

housings to NEMA-4 standards can take the punishment of high humidity, steam, and production line wash down.

When products are changed on the line, the transducer head can be adjusted to various heights, and the appropriate circuit modules inserted. This makes for rapid changeover and low maintenance costs.

Swelled or buckled containers can be detected and automatically rejected before they are packed or cause jams in equipment down line with the Buckled Can Rejector, Model 4060.

The NEMA-4 stainless steel enclosure is fully waterproof and can be washed down repeatedly. Lights on the panel monitor the function of the unit. The BCR has the same reliable air-operated ram that is used on the Line Tap Tone. A built-in crank operated mechanism allows the unit to be quickly adjusted for cans of various heights.

Tap Tone equipments are manufactured by Benthos, Inc., North Falmouth, Mass., U.S.A.

UNDP

Opportunity for Developing Nations

The UNDP Governing Council's Technical Co-operation among the developing countries approved measures to increase the use of exports, equipments and sub-contractors from developing countries in projects of United Nations Development Programme.

The draft adopted by the Council approved the use of capacity of developing countries for providing experts and consultants, fellowship placements and sub-contractor services and equipment, for strengthening technical co-operation in general and technical co-operation among developing countries in particular. The United Nations Developing Organizations are called upon to identify and collect information to allow more flexible approach in order to make use of experts from developing countries.

Increased Contributions

The Governing Council of the United Nations Development Programme (UNDP) ended a three-week session in Geneva with a call to Governments for an increase in contributions, so that the programme could reach its target of 14 per cent annual growth resources. The Governing Council also called for better co-ordination between UNDP and other United Nations agencies carrying out projects with UNDP funds. It was suggested that there should be 'more flexibility' in UNDP to improve its effectiveness in meeting needs of developing countries.

CANADA

Shipping Services

The Canadian City Line suspended its 50-year-old shipping service to Sri Lanka and India from May 1977, because the cargo movement to the Indian sub-continent was falling off and competition from Indian Lines for outward bound cargoes was increasing.

WEST GERMANY

Aid-India Club

The Aid-India Consortium, which consists of 13 donor countries and six World Bank institutions, has pledged a sum of $ 1,700 million as aid and grants to India for 1976-77. This consists of

$1000 million to be provided by the donor countries of the Club on bilateral basis and the balance of $ 700 million from the World Bank. The amount also includes $ 160 million as debt relief. The United States Government has not made any new pledge but they have signed an agreement with India under P.L. 480 for US$ 83 million and are making another proposal for assistance of $ 61 million though it is not clear when this second offer would materialise. If it does, the total aid committed could go up to broadly same level as in 1975-76.

This year's pledged aid is broadly the same as last year's. Britain is reported to have promised an aid which is 10% higher than in 1975-76; Japan has increased its contribution marginally. Some donor countries have also shown a good gesture by softening their aid terms; for example, West Germany has agreed to offer aid to India on the same soft terms as those of the International Development Association. Per capita aid to India over the past three years has averaged at only $ 1.5, which is lower than 1.5% of gross national product of the country. This compares with the aid-income ratio of 8% in case of Pakistan and 10% in case of Bangladesh.

SWITZERLAND

Honey Market

The world's honey producers, many of whom are in the developing countries, are not taking full advantage of the export potential for their product. This is the conclusion reached in a new study by the International Trade Centre. UNCTAD/GATT entitles major markets for honey: openings for quality supplies from developing countries.

The study finds that world demand for honey has been on the upswing in recent years, largely due to higher living standards, but also because of heightened interest in natural foods, the emergence of new markets (e.g., Japan) and more aggressive marketing by some packers and retailers. The subsequent world shortage of honey has not been caused, however, by low production the problem has been that only 13 to 20 per cent of the estimated 800,000 tons of honey produced annually ever finds its way on to the world market.

The major bottlenecks to penetration of this interesting market, the study concludes, have been: failure to meet quality requirements in the importing countries (the major hurdle) or to satisfy consumer preferences in taste, colour or consistency; problems of collection, storage and transport; shortages of trained personnel; a lack of marketing expertise and knowledge of the target markets.

The study on honey is available free of charge to interested readers in developing countries. Orders should be addressed to International Trade Centre UNCTAD/GATT, Editorial and Publishing Section, Palais des Nation, CH-1211 Geneva 10, Switzerland.

ITALY

International Fair

The 32nd International Exhibition of Food Preserving Industries, Industrial Installation and Equipment, Packaging, Preservers will be held in Parma (Italy) from 24th September to 2nd October 1977.

The Fair will exhibit plants and equipments for the preserved food industries (animal, vegetable, fish), machinery for packing and packaging, scientific contro

instruments and apparatus, packaging and containers for food products, raw materials and auxiliary products, machinery and plant to dehydrate and lyophillate, industrial refrigeration, preserved food products.

For more details : Ente Autonomo Mostra Conserve—Parco Ducale—43100 PARMA, Italy.

THE NETHERLANDS

Machevo-Milieu—78

The Committee of European Manufacturers of Food Machinery (COCEMA) will conduct a fair (Machevo-Milieu—78) from 30th October to 4th November 1978 at Utrect, Holland. The International Fair will exhibit plant, equipment, accessories for beverage, dairy, food and pharmaceutical industry. During this period the 5th International Cost Engineering Seminars will also be held. More information may be had from Royal Netherland Industries Fair, P.O. Box 8500, 3502 RM Utrect, The Netherlands.

BAHRAIN

Congestion at the Ports

The Bahrain port operations announced that the congestion at Bahrain has been eliminated since early May with nil waiting time. This is due to the introduction of two extra berths and the arrival of South Korean Stevedoring company to work at the port. Other helpful influences were the improvements in the mechanisation and palletisation of cargo, and the good response from the merchants to the Government's appeal to avoid stock-piling goods in the port.

IRAN

Elimination of Congestion at the Port

The Iranian Ministry of Transport and Roads has announced that there is no longer any congestion in Iran which is totally clear of surcharges and waiting time, due to improvements made at the ports. But the problem of goods holdups still continues. The port authorities have cautioned the importers that they would face double demurrage charges unless goods were cleared within 30 days and any cargo still left after 45 days was liable to be transported out of the port area at the importers' cost.

DUBAI

United Arab Emirates

Seven independent emirates bordering on the Gulf formed themselves into a federal unit known as the United Arab Emirates in 1971. During the five years of its existence under the leadership of Sheikh Sayed Sultan Al Nahyan much has been done to knit these seven units together. These seven states—Abu Dhabi, Dubai, Sharjah, Ummul Qaiwan, Ajman, Kujeira and Rasal-Khaimah—were earlier known as the Trucial States. The original proposal included Bahrain and Qatar but these two states stayed out.

The U.A.E. has done much to encourage development in other Arab countries through Abu Dhabi Fund for Arab Economic Development which has financed projects in North Yemen, Algeria, Sudan and Syria. It has set up an African Development Fund in co-operation with Libya to finance development project in African States. U.A.E. has played an important role on the eventual aim of forming a Gulf Common Market with unified currency. Co-

operation agreements have been signed with Kuwait, Qatar and Bahrain as a first step for this eventual unification.

The leaders of the seven federating states have formed themselves a Supreme Council, the highest authority of the Federation. Each emirate has a single vote in the deliberations of the Council. Duties include formulation of general policy for U.A.E. and to sanction laws before the promulgation. President and Vice-President of the Supreme Council are elected from the members of the Council with term of office for five years. The Supreme Court is presided over by the President and four judges and is based at the capital of U.A.E., Al-Ain. The authority immediately next to the Supreme Council is the Council of Ministers which consists of a Prime Minister, a Deputy Prime Minister and a number of Ministers. The Federal National Council consists of 40 elected members from the emirates.

Dubai, the traditional centre of commerce for many years, has adapted to modern conditions with an ultra modern port—port Rashid, opened in 1972. It has 15 deep water berths and several coastal berths. The discovery of oil in Dubai has increased the importance of the port considerably and is equipped with all details of infrastructure needed by a modern port.

Another modern and equally important port is at Abu Dhabi, first stage.

Sharjah port is fast developing and gaining in importance. Rasal-Khaimah is the fourth emirate in the U.A.E. with an artificial port.

The U.A.E. has the best telephone system in the Gulf, with direct subscriber dialling between some of the emirates, and offers efficient telecommunication links with the rest of the world. Abu Dhabi, Dubai and Sharjah are on the international telex system providing direct connections to Europe, U.S.A. and the Far East. Dubai is the nerve centre of U.A.E.'s international communications.

The federal newspaper is Al-Ittihad and is printed daily in Abu Dhabi for distribution throughout the emirates. A second paper, Al-Wahda, is produced every Saturday. A law has been passed controlling the production, import and export of printed audio-visual materials.

Considerable developments have been made in agriculture, yet most of the food needs have to be imported. An agricultural research centre has been opened at Rasal-Khaimah and an Agricultural Trial Station at Digdage. Research in livestock breeding is going on a pace. A Department of Agriculture has been set up in Al-Ain. In spite of the developments, agricultural products of indigenous origin are available only during winter. During the hot months people have to depend on imported foodstuffs. A system to grow crops in the desert has been successfully implemented and this supplies local markets with cucumbers, tomatoes, pepper, cabbage, beans etc. Research is also being made into plant breeding and all branches of horticultural development.

Fishing is getting a boost with the encouragement of the Government. Many international fleets are operating in the offshore waters and the Government is trying to offset this invasion by training local fishermen in modern methods of fishing and introducing the most up-to-date equipment available for the purpose. Apart from oil, the U.A.E. Government is concentrating its efforts on exploiting rich potentials of fishing and agriculture.

YEMEN

Floating Dock

A 4,500-ton floating dock of pontoon type will commence operation at Aden

shortly. The dock is expected to accommodate ships of 5,000 dwt, 137 metres long, 31 metres wide with a depth of 11 metres. It will also be able to handle two ships at a time and is the first of its kind in Red Sea region. Named Yemen Dock, it will be operated by the Yemen Docks Company.

BANGLADESH

IDA Aid

The International Development Association (IDA), an affiliate of the World Bank, is extending a credit of $10 million to Bangladesh for a project to assist agricultural extension and research in the north-west region (Rajshahi Division) of Bangladesh, which covers about one-fourth of the area and population of the country.

The project will strengthen the extension system in the north-west region. Under the project, the number of agricultural extension workers will be increased from about 1,000 to about 1,420. Necessary vehicles, training equipment and housing for the extension staff will be provided. The project will also help make research more relevant to agricultural development and establish closer links between research and extension services. Technical assistance in the field of extension and research supports the efforts of making the extension system in the north-west region more effective. The project also includes a pilot programme to increase the areas currently irrigated by about 1,500 deep tubewells.

PAKISTAN

ADB's Special Fund

The Asian Development Bank has accepted from the Government of Pakistan a fourth contribution of Rs. 500,000 (equivalent at current rates to approximately US$ 50,000), on a grant basis, to the Bank's Technical Assistance Special Fund.

With this contribution Pakistan's total contributions to the Technical Assistance Special Fund have reached about US$ 185,000 equivalent.

The fourth contribution, like the earlier ones, will be used to finance the services of Pakistani consultants and experts as may be required by the Bank in providing technical assistance, conducting feasibility or pre-investment studies, processing loan applications, appraising projects and training of personnel that may be undertaken by the Bank in the course of its operations.

MAURITIUS

Import Regulation

Importers in Mauritius are required to pay a 50 per cent deposit on all goods imported into that country on or after April 30, 1977, following the Government of Mauritius legislation on March 5, 1977.

They are required to keep deposits with the Bank of Mauritius when imports are financed by means of a letter of credit at the time of opening the letter of credit ; and whenever the importation order is made or the import agreement is reached.

Those who export to Mauritius should ensure before making shipments that buyers in that country have complied with the import deposit requirements.

U.S.S.R.

Environmental Education

An International Intergovernmental Conference on Environmental Education will be held from 14 to 26 October 1977,

in Tbilisi, U.S.S.R. This has been announced by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Environment Programme (UNEP).

The first meeting of this kind at ministerial level, the Conference is being organized by UNESCO, with the technical and intellectual co-operation and financial support of UNEP.

Its main purpose will be to formulate recommendations for action at national, regional and international levels for the promotion and development of environmental education.

The Conference will consider the role of education in facing the challenge of environmental problems and strategies for the development of environmental education of the general public inside and outside the school system, as well as specific educational programmes for those whose decisions and actions have a major effect on the environment. Regional and international co-operation in this field will also be discussed.

NEPAL

ADB Assistance

The Asian Development Bank has approved technical assistance to Nepal to formulate a forestry project to help meet a shortage of fuelwood for industrial and household use in the Central Terai region.

The technical assistance will be implemented by the Food and Agriculture Organization (FAO) Investment Center with the objective of formulating a reforestation project in the Janakpur area of the Sagarnath Forest, in the Central Terai region of Nepal.

It will review a study carried out by FAO earlier this year on the proposed Sagarnath Forestry Development Project under which about 10,000 ha of existing woodland would be cleared and harvested and replanted with fast-growing multipurpose timber species. The cost of the reforestation project which could emanate from the technical assistance is estimated at about $ 9 million.

The technical assistance will be to compile relevant data on the proposed project, examine field conditions for developing a systematic reforestation programme in the area, and formulate and assess the project in its technical, economic, financial and managerial aspects.

Highway Project

The International Development Association (IDA), the World Bank affiliate, has given a credit of US $ 17 million for the Second Highway Project in Nepal. The main purpose of the project is to assist the Government expand and maintain the road network for economic development.

The feeder roads generally will follow existing tracks. Grass and trees will be planted along the main roads as part of slope stabilization measures.

Nepal is a mountainous land-locked country with an estimated per capita income of $ 110 per year. It is one of the least developed countries in the world. Historically, transportation has been by porters and pack animals. It has one of the smallest road networks of any country in the world.

Since 1951, when Nepal emerged from a century of isolation, development efforts have emphasized infrastructure, particularly roads, in order to integrate the

village economies. Road construction outside of the Kathmandu Valley began in 1953 and the road network now consists of 4,200 kilometres, of which about 1,600 kilometres are paved.

The First Highway Project in 1970 included the construction of road and porter suspension bridges and a four-year road maintenance programme. The present project is part of the Government's Five-Year Plan (1976-80).

The Second Highway Project was developed as an extension to the First Highway Project. The main objective of the second project is to contribute to the maintenance and improvement of Nepal's transportation system in order to facilitate economic development. The roads will stimulate agricultural production and reduce user costs. The maintenance will help preserve the existing highway.

The project provides for construction of a feeder road connecting the Dang Valley to the East-West Highway in the Far-Western Region of the country. It will upgrade the mountainous section of the main road between Kathmandu and the Indian border, support the Government's Five-Year Road Maintenance Programme, train mechanics and provide consultant services,

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Government Notification

Export of Onions During 1977-78

Export of Onions During 1977-78

An extract from the Export Instruction (No. 46/77, dated the 9th June 1977), issued by the Chief Controller of Imports and Exports, Government of India, Ministry of Commerce, New Delhi, is reproduced below for information of the trade :—

Reference Export Instruction No. 31/77, dated the 13th April 1977*, on the above subject.

2. Export of onions which was canalised through National Agricultural Co-operative Marketing Federation (NAFED) has been banned w.e.f. 13th May 1977, by the Ministry of Civil Supplies and Co-operation.

3. It has now been decided by the Ministry of Commerce to release a quota for export of onions through NAFED only during 1977-78. This will also include the shipments, if any, made by NAFED, from 13th May 1977, onwards.

4. The entire ceiling has been placed at the disposal of the Jt. Chief Controller of Imports and Exports, Bombay, for the purpose of licensing. The applications received at other than Bombay ports may be considered after obtaining the ceiling from the Joint Chief Controller of Imports and Exports, Bombay.

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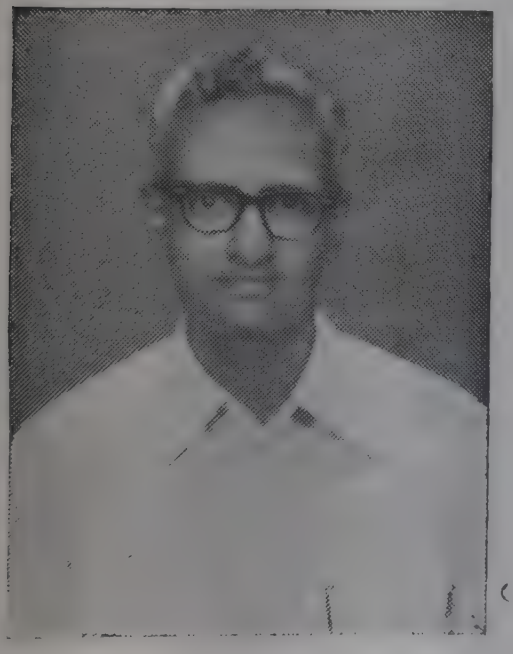
- *Shri R. K. Mahajan*
- *Shri K. N. Khanna*
- *AVI Publishing Company*
- *Indian Institute of Foreign Trade*
- *National Fruit Products, Ludhiana*
- *The Advertising Club of Bombay*

Dr S. Neelakantan

Dr S. Neelakantan has been promoted as Professor and Head of the Department of Food Technology at the Tamil Nadu



Agricultural University, Coimbatore. After obtaining his B.Sc. (Chemistry) degree of the University of Madras in I Class, he joined CFTRI, Mysore, in 1957. He worked as a research assistant in different projects. He was associated with projects on plant acids of tamarind, production of tamarind juice concentrate, integrated production of tartaric acid and pectin from tamarind, production and thermostability of Active Dry Baker's Yeast etc.

He obtained the Associateship of the Institution of Chemists, Calcutta. In 1964, he joined M.Sc. (Food Tech.) at the International Food Tech. Trg. Centre, CFTRI, and was awarded I Rank and Girdharilal Gold Medal in 1967.

In 1968, he left for U.S.A. to pursue his higher studies at the University of Nebraska, Lincoln. He obtained Ph.D. in Food Technology with Human Nutrition as minor in the year 1970. He worked on poultry meat emulsions for his thesis. He continued in the same place as a post-doctoral fellow and had two assignments, viz., (i) effect of lipases on flavour modification in cheeses and (ii) presence of mycotoxins in foods. During this period, he was elected as a member of two Honour Societies, viz., Gamma Sigma Delta and Sigma Xi.

In 1972, he returned to India and joined the Indian Veterinary Research Institute, Izatnagar, as a Meat Technologist. He standardised procedures for the production of serum and whole blood protein meals from slaughterhouse blood and also determined their nutritive values.

In 1974, he joined as Associate Professor and Head of the newly created Department of Food Technology at Coimbatore. Besides teaching, he has varied interest currently in the processing of fruits and tubers, peanut butter, cooking qualities of legumes, and preservation of shell eggs.

Shri R. K. Mahajan

Shri R. K. Mahajan is the Managing Director, The Glacier Products (I) Pvt. Ltd., Pathankot.

Born on 15th March 1952, at Delhi, he completed B.Sc. (Non-medical) from D.A.V. College, Chandigarh. Shri Mahajan joined Punjab Agricultural University College, Ludhiana, from where he completed his M.Sc. (Pre) and then shifted to Institute of Hotel Management, Pusa, from where he completed his one-year diploma in Food Preservation.

Shri Mahajan is responsible for bringing a dynamic change in Glacier Products (I) Pvt. Ltd. His efforts have won ' Glacier Products' 1st prize in Punjab Citrus Show 1976 and 1st prize in All India Mango Show 1977 in ' Mango Squash and Mango Pulp '.

Shri K. N. Khanna

Shri K. N. Khanna is General Manager, U.P. State Agro Industrial Corporation Ltd. (A State Government Undertaking). U.P. Agro has at present about eight large scale canning and bottling factories besides three packing cases factories all over the State. Shri Khanna assumed the charge of the General Manager on 5th November 1976.

Shri Khanna was born on 15th June 1942. After obtaining his Master of Science degree in Mathematics in 1963, he joined CFTRI, Mysore, and obtained Post-Graduate Associateship in Food Technology from the Institute. He also attended the seminar on Project Identification, Promotion and Implementation organized by IFCI through Management Development Institute, Delhi.

After obtaining advanced course in Food Technology from CFTRI, Shri Khanna was with Messrs. Mohan Meakins

Pvt. Ltd., Messrs. Greenland Foods (P) Ltd., and Messrs. Kissan Products Ltd. In Kissan Products, he was incharge of quality control, research and product development.

He joined U.P. State Agro Industrial Corporation Ltd. as Deputy General Manager and assumed the charge of General Manager, U.P. State Agro Industrial Corporation Ltd., at a very young age of 35 years. He excells in quality control and product development.

AVI Publishing Company

AVI Publishing Company, established in 1921, is the leading publisher of books in Food and Agriculture, Nutrition and Health, reference books for industries, textbooks and manual of colleges and for vocational education.

Donald K. Tressler, Ph.D., President and General Manager of AVI, was the former Scientific Director, Quartermaster Food and Container Institute for the Armed Forces ; Head, Chemistry Department, New York State Agricultural Experiment Station ; Professor, Agricultural and Food Chemistry, Cornell University ; and Author or Co-Author of 19 books on food science.

Norman W. Desrosier, B.S., M.S., Ph.D., Vice-President and Editor-in-Chief, is the President, the New Product Company, Westport, Connecticut; formerly Corporate Director of Research, Nabisco, Inc.; Vice-President, Research and Development, Beech-Nut Life Savers, Inc.; Member, Atoms for Peace Mission to Europe ; Deputy Scientific Director, Quartermaster Food and Container Institute for the Armed Forces; Professor of Food Technology, Purdue University; and Assistant Professor of Food Research, University of Massachusetts.

Wilfred W. Tressler, B. Ind. D., is the Vice-President and Advertising Manager, Industrial Designer, formerly a Professor on the Faculty of Industrial Design, University of Bridgeport.

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The Indian Institute of Foreign Trade was established by Government of India in 1964 with the objective of ensuring adequate and continuous supply of trained export management personnel and providing marketing information to trade and industry on products and countries of export significance to India. The principal activities of the Institute include :

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During the twelve years of its operation, the Institute has earned meritorious recog-

nition from trade and industry and export institutions both within the country and abroad mainly through the completion of as many as 12 export potential surveys of the states, 34 overseas market surveys and 61 in-country studies. Over 4,600 executives have been trained through its various training programmes.

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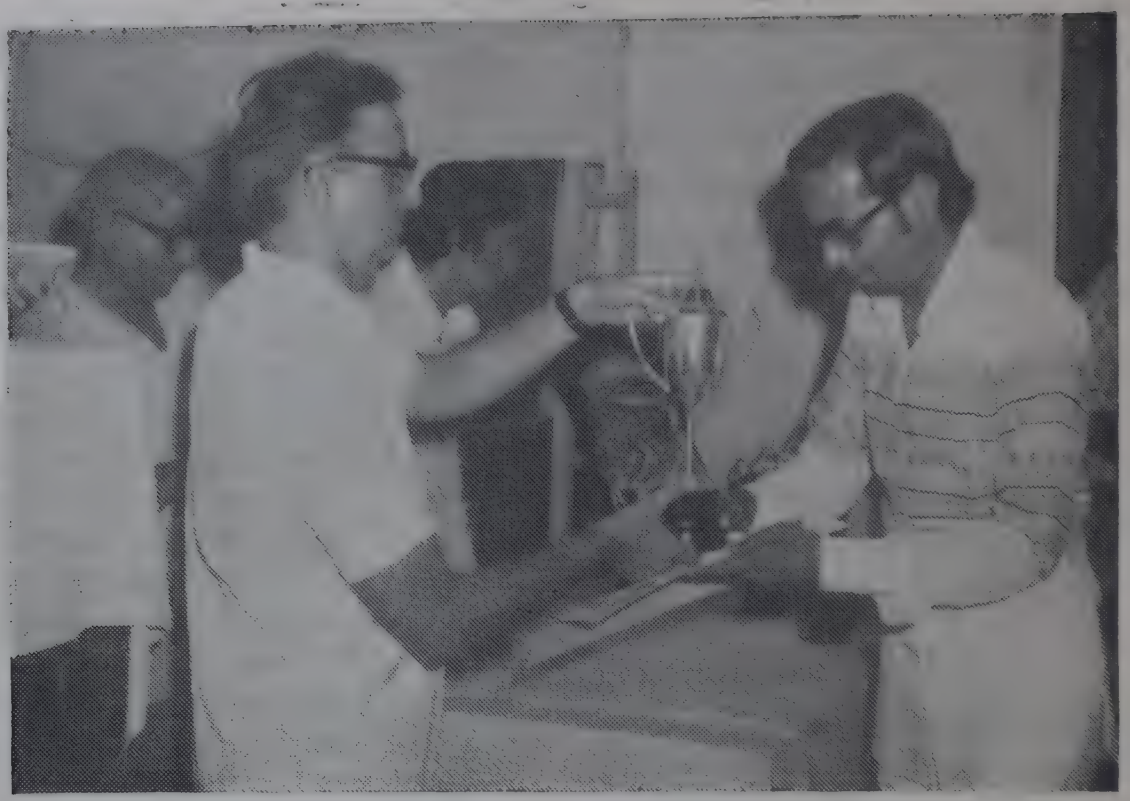
National Fruit Products, Ludhiana

The National Fruit Products was started in 1956 as a cottage industry for the manufacture of Preserves and Pickles. Within 21 years, it has developed into a large scale industry of Punjab for the manufacture of Preserves, Pickles, Canned Fruits, Bottled Juices, Syrups, Squashes, Sauces. Two more units with the name of Napro Foods, Ludhiana, with branch office at Panipat for the manufacture of bottled drinks, juices, canned fruits, and another Ram Saroop Ramesh Kumar, Ludhiana, with branch office at Panipat for pickles have been opened in 1975.

The Company won first prize for Apple Preserve in the All India Apple Show in July 1977, and 3 first prizes and 5 second prizes in the All India Mango Show. The first prizes are for Mango Juices, Squash

Our Partner Shri Raj Kumar Gupta receiving Prize



Our Factory Manager Shri D. P. Bansal receiving First Prize at All India Mango Show, New Delhi, 1977

and Candy and Second prizes are for Pickles, Jam, Slices in syrup and Lacha.

This year, the Company has secured export orders from U.K., U.S.A., and Gulf countries for pickles, preserves and canned fruits.

The Advertising Club of Bombay

The 23rd Annual General Meeting of the Advertising Club, Bombay, was held at M.C. Ghia Hall, Rampart Row, Bombay-400 039, on 27th May 1977. Mr Jagmohan Malhotra took the Chair. During the year two new sub-committees were formed, one Consumer Affair sub-committee under the chairmanship of Mr Hafeez Noorani, and the other Social Objectives sub-committee under the chairmanship of Mr K. Kurien. The Solus committee continued to publish the 'SOLUS' with interesting news ; the Art Ball sub-committee under the leadership of Mr Rajendra Jain staged successful entertainment. The following were elected :

President	:	Mr Roger C. B. Pereira
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		Mr Jagmohan Malhotra
Jt. Hon. Secretaries.	:	Mr R. N. Gupta
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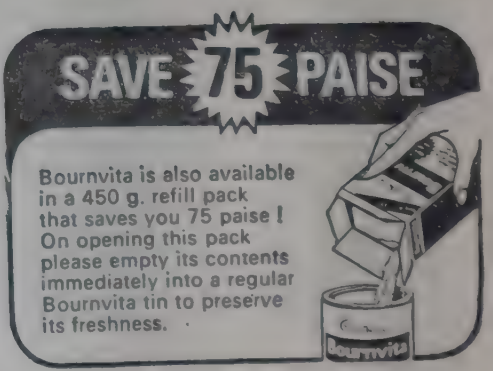
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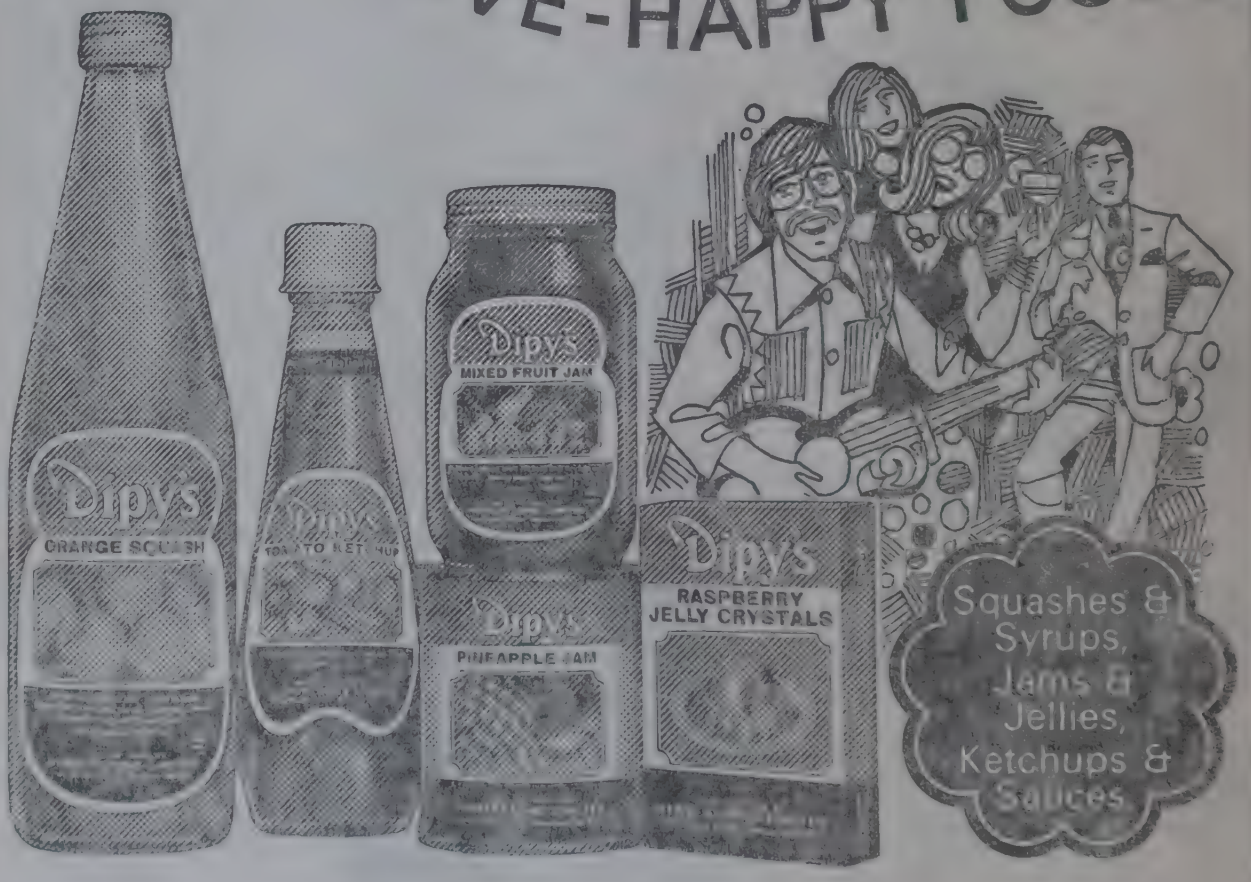

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Sambhar Mix

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Mixed Vegetable
Green Peas
Onion
Non-Vegetarian:
Chicken
Cream of Chicken
Chicken Noodle
Chicken & Green Peas
Mutton

PROCESSED FOODS
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ALL INDIA FOOD PRESERVERS' ASSOCIATION

take pleasure in announcing

"Raylon Award" 1977-78

for the innovation of a Machine/Equipment
for use by the Fruit and Vegetable Processing
Industry

Amount of Award	...	Rs 10,000.00
Last date of receipt of application	...	31st December 1977
Presentation of Award	...	April/May 1978 At the Annual General Meeting of the All India Food Preservers' Association

Date and Venue will be intimated later

APPLICATION FORM

1. Name and address of the applicant (s)
2. Name of the equipment
- 2.1 Model No.
  Code No.
  Purpose/use
- 2.2 Brief description of the process along with the role played by the equipment
  Literature, working pamphlet and photograph of the equipment
- 2.3 Is it a prototype or working epuipment/machinery
- 2.4 Improvements carried out after first introduction
- 2.5 Deficiencies of the equipment and how are they overcome in the new design
- 2.6 Any additional advantages of the new design
- 2.7 Working principles and operation
- 2.8 Power requirements and space requirement
- 2.9 Ex-works price
- 2.10 Flexibility and versatility of equipment
- 2.11 Names and addresses of the fruit and vegetable processing units who are using the equipment
- 2.12 How many machines are in use in the country and abroad
- 2.13 Have you previously applied for an award for this equipment elsewhere. Give details
- 2.14 Is it a copy of existing Indian or Foreign made Machine/Equipment or an original idea
- 2.15 Capacity, efficiency and cost compared to original equipment

2.16 Advantages of the equipment in reducing processing cost.

2.17 National importance of the machine
Import substitution

2.18 Export potential

2.19 Estimated number of machines required to meet national needs

2.20 Any other plus point justifying claim for the award

Please forward the application form completed with full details and enclosures along with registration fee of Rs 10 per each entry to :

V. B. OBEROI
(*Convener*)

"RAYLON AWARD" Sub-Committee
ALL INDIA FOOD PRESERVERS' ASSOCIATION
C/o Kissan Products Limited
Old Madras Road
Bangalore-560 016

The information will be kept in confidence.
The deliberation of the judging committee will be held in camera.
The decision of the judging committee will be final.

ALL INDIA FOOD PRESERVERS' ASSOCIATION

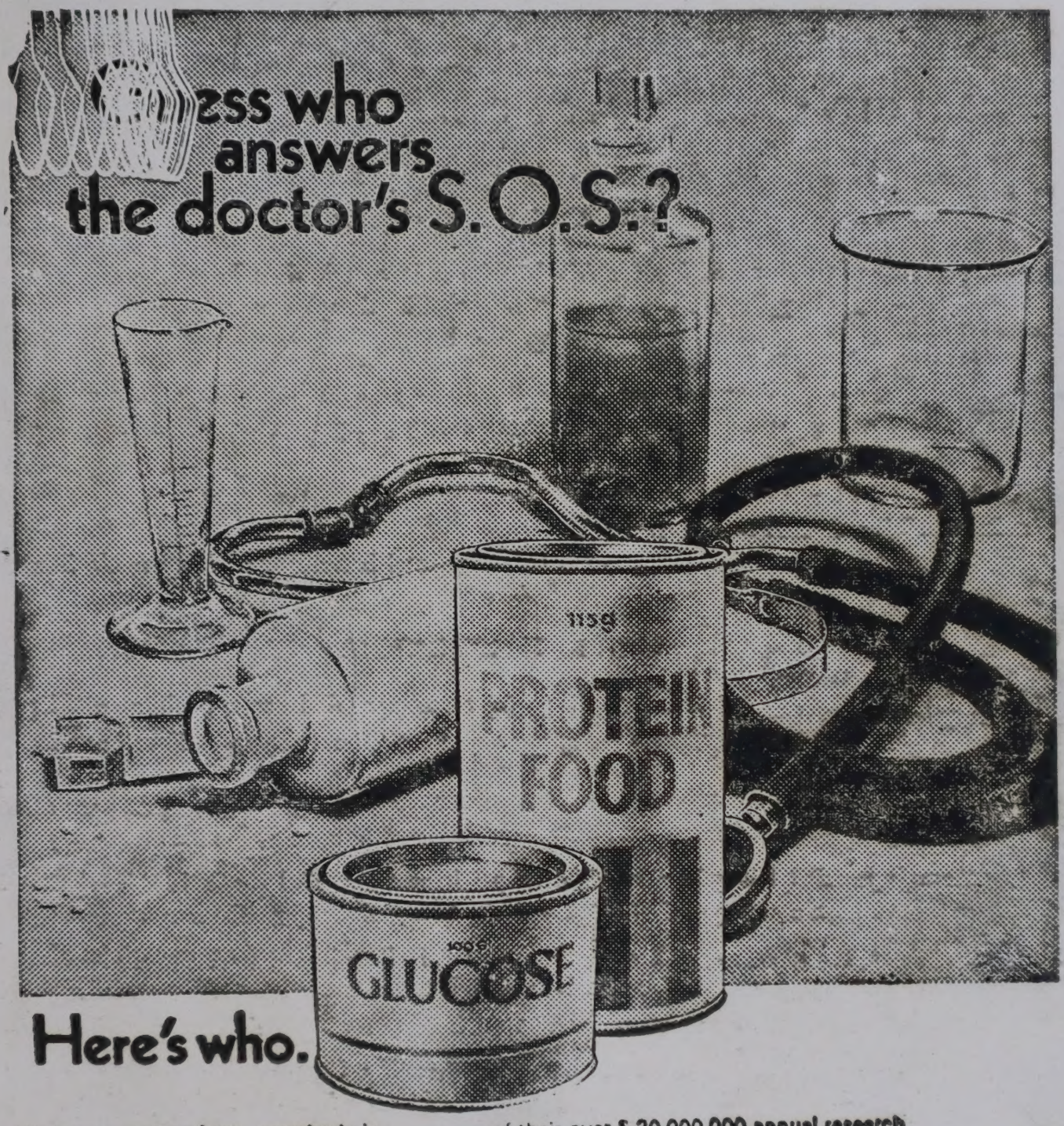
ANNOUNCE THE FOLLOWING AWARDS for 1977

Vol. XXXI, INDIAN FOOD PACKER

K. U. Patel *Memorial* Award (Rs. 1,000) donated by All India Food Preservers' Association for the Best Paper.

N. N. Mohan *Memorial* Award (Rs. 1,000) donated by House of Mohmeak's for the best Research Paper.

Yezdi Award (Rs. 1,000) donated by F. K. Irani, Chairman and Managing Director, Yezdi Distilleries, Mysore, for the paper which has a bearing on the research and development of new products.



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